Increasing Pre, Peri and Postmenopausal women's activity levels:

A Theory of Planned Behaviour approach to a behaviour change intervention

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Abstract

Background: Given that the menopause brings additional risk of non-communicable diseases preventable by undertaking physical activity, action is needed to increase the proportion women undertaking recommended levels of physical activity as they transition from pre- to post-menopause. The aim of this thesis was to develop and test the feasibility and acceptability of an intervention to promote recommended levels of physical activity among pre-, peri- and post-menopausal women using a two component model of the Theory of Planned Behaviour.

***Methods*:** This study employed a mixed method multiphase research design and as such three phases of research guided by the Theory of Planned Behaviour were undertaken: (1) the cognitive processes underlying pre-, peri- and post-menopausal women's decision to perform recommended levels of moderate physical activity and muscle strengthening activities were explored using qualitative methodology and analysed using thematic analysis; (2) significant predictors of intention and the relative importance of those predictors were explored using quantitative methodology. Descriptive statistics, bivariate correlations, regression analyses and analysis of variances; were used to analysis the data and: (3) a mixed methods study involving a randomised controlled trial and a qualitative evaluation was undertaken to determine the feasibility and acceptability of an intervention designed based on the findings from phase one and two. Descriptive statistics, independent samples T-Tests, mixed within and between subjects repeated measures analysis of variance were used to analysis the quantitative data, qualitative data was analysed using thematic analysis.

Results: Phase one: Attitudes toward undertaking moderate physical activity were positive across groups however, motivational differences were apparent. Attitudes

towards undertaking muscle strengthening activities were negative and knowledge was identified as the main factor that influenced women's attitudes and motivation towards undertaking this mode of physical activity. Phase two: The results showed that self-efficacy followed by affective attitude and descriptive norms were the main predictors of women's intentions to undertake moderate physical activities. With regards to muscle strengthening activities, self-efficacy followed by affective attitudes were the main predictors of intention. No significant differences between groups were evident. However, belief based measures supported the findings from phase one illustrating slight differences across groups. Phase three: The results showed that the intervention was feasible and acceptable to pre- and post-menopausal women. However, the results indicated that the acceptability of the intervention could be improved by removing or altering the reward, monitoring of emotional consequences and practical social support elements of the intervention.

Conclusions: Overall, the findings from this thesis provide support for the feasibility and acceptability of an intervention based on the Theory of Planned Behaviour. However, the intervention should be refined and a larger scaled evaluation undertaken to determine the effectiveness of this intervention.

List of Abbreviations

TPB	Theory of Planned Behaviour
MPA	Moderate physical activity
MSA	Muscle Strengthening Activity
PA	Physical activity
NCD	Non-Communicable Diseases
BMI	Body Mass Index
IPAQ-SF	International Physical Activity Questionnaire – Short Form
DoH	Department of Health
NICE	National Institute of Clinical Excellence
MRC	Medical research council
Yrs	Years
WHO	World Health Organisation
UK	United Kingdom
NI	Northern Ireland
RD	Respiratory diseases
Pre	Pre-menopausal
Peri	Peri-menopausal
Post	Post-menopausal
CVD	Cardiovascular diseases
RD	Respiratory diseases
GDM	Gestational diabetes
PBC	Perceived Behavioural Control
PCS	Physical component summary
MCS	Mental component summary
SF-12	Health survey-Short form
WHF	World Health Foundation

Chapter One

General introduction

1.0. Introduction

Preventing rising rates of non-communicable diseases (NCD) such as cardiovascular diseases (CVD), respiratory diseases (RD), cancers and diabetes which contribute to economic and social costs is a major public health priority. In response, the World Health Organisation (WHO) has developed a global action plan for the prevention and control of NCD (WHO, 2013) which emphasises the need to minimise known risks (i.e. excessive alcohol, low physical activity, high salt/sodium intake, tobacco use, hypertension, diabetes, obesity and inadequate treatment for the prevention of heart attacks and strokes) in order to tackle one of the main challenges facing public health at present.

It is well accepted that national and local governments cannot afford to dismiss current health trends and have a fundamental role in minimising risk factors. While some improvements have been made in relation to public health goals, if targets are to be achieved and future public health improved, more effort is needed. In the United Kingdom (UK) strategies such as "*Healthy Lives, Healthy People*" (Department of Health [DoH], 2012) and "*Making Life Better 2012-2023*" (DoH, 2014) have emerged reflecting global recommendations for health and outlines areas of action. In Northern Ireland (NI), the "*Making Life Better framework 2012-2023*" illustrates that strategies considering at risk populations and adopting a life course approach are required to improve health and reduce rates of NCD (DoH, 2014). Researchers can contribute significantly to current health agenda's by developing evidenced based interventions for at risk populations across the life course. Such approaches acknowledge the influence of biological, psychological and social functions on health and chronic

disease, recognising that these factors change throughout the life course (Jasper et al. 2015).

1.1. Target groups: Pre-, peri- and post-menopausal women

Identifying "*at-risk populations*", commonly referred to as "*target groups*", not only acknowledges the need to reduce health disparities but also recognises that risk and needs differ between diverse populations. If interventions are to have the desired affect it is important that the mechanisms employed reflect the target group's needs in a local context (The National Institute for Health and Care Excellence [NICE], 2007).

Currently CVD, RD, diabetes and cancers are the greatest threat to women's health with approximately 18 million deaths collectively attributed to these conditions each year (World Heart Foundation, 2011). In addition, the long-term disability associated with the onset of these conditions (Beaglehole et al. 2011) is a major concern for public health due to the impact on families, health care services and the additional years lost to ill-health. As a result, recent publications including "*Non-communicable diseases: a priority for women's health and development*" (World Heart Foundation, 2011) and the "*Global Strategy for Women's, Children's and Adolescent's Health*" (WHO, 2015) acknowledge the importance of preventing NCD among women, calling for further action in this area.

There are many distinct issues that suggest women are at particular risk of NCD and require specific attention. For example, female life expectancy in Europe is exceeding that of males and as a result, the proportion of older females within the population is increasing (Eurostat, 2012). This growth in our ageing population is in part

responsible for rising rates of NCD in women. Furthermore, the menopause, a universal occurrence for women increases the risk of developing many NCD including CVD, cancers, musculoskeletal conditions, diabetes, obesity and high blood pressure (Agrinier et al. 2010; Lisabeth & Bushnell, 2012; Lovejoy, 2009; Palombaro, Black, Buchbinder & Jette, 2013). The menopause is also linked to psychological factors such as levels of motivation, beliefs and psychological well-being in women. Furthermore, the menopause typically occurs alongside changing social environments such as: family dynamics (such as a child leaving home); divorce; mortalities; and changing social circles. As women age the aforementioned biopsychosocial changes represent key transitional stages that interact to influence women's health, health behaviours and their associated characteristics. Therefore, the menopause is both a risk factor and a developmental phase that influences women's health. Given the call for further action regarding women's health, it is surprising that few initiatives adopt a life course approach based on menopausal status. This is despite the knowledge that the female life course is characterised by three distinct menopausal phases, referred to as pre-menopausal (pre), peri-menopausal (peri) and post-menopausal (post). To date, no research has acknowledged the menopause as a focal point for interventions adopting a life course approach with the aim of promoting active ageing and preventing rising rates of NCD among women in NI.

In order for interventions to have the desired effect it is not only important to select target groups that are at high risk but it is necessary to identify a known risk factor of NCD that requires change within the target populations. Although multiple risk factors are evident among women, low levels of physical activity (PA), defined as failing to undertake minimum recommended levels of 150 minutes of moderate intensity physical activity (MPA) each week and muscle strengthening activities (MSA) on at

least two days, per week (DoH, 2011) is of particular concern. The research within this thesis proposes that developing an intervention to promote pre-, peri- and post-menopausal women's participation in minimum recommended levels of MPA and MSA will not only aid our understanding of the corresponding needs across the female life course but target populations at particular risk of NCD and recognise health priorities within NI.

1.2.Target behaviour: Recommended levels of physical activity

According to the DoH (2011) undertaking at least 150 minutes of MPA with additional MSA on at least two days, per week reduces the risk of developing many NCD. Thus, low levels of PA particularly among the ageing female population, is a major global health concern due to rising rates of NCD. Research indicates that PA levels decline significantly with age at a population (Hallal, Anderson, Bull, Guthold, & Haskell, 2012) and national level (British Heart Foundation [BHF], 2012) with some studies noting a 40% reduction in PA levels evident during the menopausal years (Elavsky, 2009). The notable decline in PA levels during midlife and later adulthood presents an additional health problem for women; as such a reduction often co-occurs alongside menopausal transition. Therefore, in women the most significant declines in PA occur during key transitional stages when preventative behaviours such as this are paramount. The repercussions are evident particularly during later adulthood when females constitute a high percentage of the population developing chronic conditions.

Recent data by the WHO (2010) report that 43.4% of females in the UK fail to undertake minimum recommended levels of MPA, a percentage that is higher than

many European countries such as Ireland, Sweden, Italy and France (40.1%, 33%, 38.1% & 28.5% respectively). Statistics from the British Heart Foundation (2015) indicates that 51% of female adults in NI are not meeting recommended levels of MPA compared to 42% in Scotland, 45% in England and 23% in Wales. To date, PA statistics focus on the aerobic aspect of the recommendations with little known about the proportion of women undertaking MSA. However, evidence from the United States (Kruger, Carlson & Kohl, 2006), Australia (Freeston et al. 2017) and Scotland (Strain, Fitzsimons, Kelly & Mutrie, 2016) suggests low adherence to this aspect of the PA recommendations. Given current PA trends, the prevalence of NCD and their risks among women (European Communities, 2009), interventions promoting both MPA and MSA are urgently required for women.

1.3. Theoretical framework: Theory of Planned Behaviour

Guidance provided by NICE (Taylor et al. 2006) and the Medical Research Council (Graig et al. 2008) recommends that interventions should have a theoretical basis. Accordingly, a theoretical framework helps to understand the constructs on which to intervene and the possible underlying processes responsible for behaviour. This information is fundamental to the success of interventions as it enables researchers to identify appropriate intervention components and evaluate programmes. However, despite such guidance, many public health initiatives are not founded on a theoretical understanding. Furthermore, despite the importance of comprehensive planning based on a sound knowledge of the target group's needs, few studies undertake adequate formative research in this domain.

This thesis aims to address previous limitations and adhere to guidance provided on the development of complex interventions. Thus, for the purposes of this research the Theory of Planned Behaviour [TPB] (Ajzen, 1991) is adopted as a theoretical framework. The TPB is one of the most widely used models within health psychology and is recognised by NICE as a means of developing more appropriate behaviour change interventions (Taylor et al. 2006). This framework provides a theoretical basis that can be used to assess the needs of the target populations by providing an understanding of the factors that influence intention to perform the behaviours under investigation. This information, in turn, guides the formulation and evaluation of TPB-based interventions (Ajzen, 2011; Giles et al. 2007; McEachan, Conner, Taylor & Lawton, 2011; NICE, 2007).

1.3.Significance of this thesis

To reiterate, despite the benefits of undertaking recommended levels of MPA and MSA, particularly across menopausal phases, research indicates that the proportion of women achieving this level of PA is not only low across the life course but significantly declines during midlife and later adulthood. To date, efforts aimed at increasing women's participation in PA have had limited success. The reason for this is unclear however, it is possible that current strategies do not meet the needs of specific subgroups within the population. Moreover, as few studies explore the feasibility and acceptability of intervention components, strategies to date may not employ the most suitable combination of behaviour change techniques. Thus, further initiatives are warranted. Of particular importance is the need for theory driven interventions that adopt a life course approach to increase women's participation in both MPA and MSA

aspects of PA. This thesis, by employing the TPB to inform the design of an intervention that targets pre-, peri- and post-menopausal women and promotes both aspects of current PA recommendations will provide a better understanding of the factors that influence the women's decision to undertake MPA and MSA at key transitional phases. In addition, this research will provide the foundation of a new evidence-based approach to increasing women's PA across the life course and could inform practice in NI.

1.5. Thesis structure

This thesis comprises of six chapters. The current chapter introduced the research problem and illustrated the need for interventions that promote recommended levels MPA and MSA among pre-, peri- and post-menopausal women. The theoretical framework for this study was also introduced. Chapter two presents a narrative review on the main issues under investigation, providing further justification for the research included within this thesis. The empirical research included in this thesis is described in sections 2.7.1, 2.7.2 and 2.7.3. Chapter three, four and five presents the empirical research. These chapters begin with a brief introduction to the research followed by an overview of the methodology and results. Each chapter concludes with a brief discussion on the key findings and the implications for the intervention design. The final chapter presents a general discussion on the work comprised in this thesis and concludes with recommendations for future research.

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Chapter two

Literature review

2.0. Introduction

Chapter one highlighted the need for interventions that promotes pre-, peri- and post-menopausal women's participation in minimum recommended levels of Moderate physical activity (MPA) and muscle strengthening activities (MSA) using the Theory of Planned Behaviour (TPB). This chapter provides a comprehensive review of the research that has influenced the direction of this work. Consequently, this chapter begins with an overview of non-communicable diseases (NCD) and women's health research which leads to information on the global, national and local burden of NCD. Next, the implications of the menopause on women's health and the recommended levels of physical activity (PA) required to produce health benefits are discussed. This is followed by a description of the theoretical framework used in this research, a summary of previous interventions using the TPB and an overview of the research process.

2.1. Non-communicable diseases and women's health research

The term NCD is used to describe a wide range of non-infectious conditions that result in long term morbidity and mortalities. These conditions include mental and behavioural disorders, neurological conditions, digestive diseases, musculoskeletal diseases, cardiovascular diseases (CVD), diabetes, cancers, congenital abnormalities, sense organ diseases and respiratory diseases [RD] (WHO, 2015). Women's health research acknowledges sex as one of the main factors that influences many NCD and their risk factors. Research in this domain considers sex specific issues that impact health (e.g. contraception; pregnancy; menopause) and also conduct research in areas

such as lifestyles and behaviour, risk reduction and disease prevention. Furthermore, research in this domain adopts a life course approach to these issues. The main NCD affecting women's health worldwide is diabetes, CVD, cancers and RD (WHO, 2013). These conditions are largely preventable by continued engagement with positive health behaviours, particularly across specific developmental phases known to affect women's health.

2.2. The history of non-communicable diseases and women's health research

In the early 19th century infectious diseases were the main cause of morbidity and mortality within the population. As these conditions have biological origins, the dominant approach to health at this time was the biomedical model. This method adopts the view that all health problems are underpinned by biological factors such as chemical imbalances, bacteria or germs. However, with advancements in medical technology, vaccinations and economic development, the factors that influence public health began to change. It was during these advancements that the number of infectious diseases declined and NCD increased (Hancock, Kingo & Raynaud, 2011), namely CVD, cancers, diabetes and RD. In addition, changes in working life (i.e. reduction in manual jobs), and increases in more sedentary lifestyles together with changes in dietary patterns have contributed to this trend.

As the number of individuals with NCD continued to increase, this trend became an increasing public health issue. It also became apparent that the traditional approach to health did not explain the complexities of modern day health problems. This view was reinforced by the WHO in 1948 who published a universal definition of health

acknowledging health as "*a complete state of physical, mental and social wellbeing and not merely the absence of disease*" (WHO, 2003). Further recognition of the need to progress from the views of the biomedical model was provided by Engle who called for a multifaceted approach to health and developed the most widely accepted model of health in modern society, the biopsychosocial model (Engle, 1989). While the WHO definition has remained unchanged over the years, the concepts and principles of health promotion promoted by the WHO now also highlights the interaction between biological, psychological and social factors on health (WHO, 2009). Psychologists working within a health domain also recognised the importance of understanding the interaction between biopsychosocial factors and health. As such, this model has guided much of the research conducted by health psychologists in recent years.

In light of this, health research has provided a plethora of support for the biopsychosocial model which has subsequently enhanced our understanding of how these factors interact to influence health. As the popularity of the biopsychosocial model increased, individualistic factors became an area of interest for researchers. This influx of research paired with the women's rights movements in the 1960/70's set the path for women's health research. Whilst separating women's health from men's health remained a contentious topic during this time, the field began to develop as a result of initiatives from the Society for the Psychology of Women and the Office of Research on Women's Health (Prescott & Kline, 2013). Consequently, our understanding of disparities between sexes in relation to many NCD such as autoimmune diseases, cancer, CVD, depression, cancer, obesity and diabetes developed significantly and has continued to grow in more recent years. As a result, women are now considered as a distinct population, with differing needs who

experience differences in heath behaviours and in the onset of health issues across the life course.

In recent years women's health has been highlighted as an area that requires further attention from policy makers and researchers (The NCD Alliance, 2011). The interest in this area has primarily developed from the progress made in relation to women's health research. Thus, with NCD the main challenge facing women's health, research acknowledging the burden of NCD among women and how gender specific issues across the life course resonate with, beliefs, attitudes and health behaviours to influence health is required. More in-depth information in this domain has the potential to contribute to current health priorities. This approach has recently been promoted by the WHO with the development of a "*Global Strategy for Women's, Children's and Adolescents' Health 2016-2030*" (WHO, 2016). This strategy has been published to aid the continued development in relation to preventing and controlling NCD at national and local levels in the post-2015 agenda.

2.3. The burden of non-communicable diseases among women

The drive to reduce NCD is dependent on the implementation of strategies targeting prevalent conditions. This is the situation not only at a global level, but particularly within national and local contexts. Therefore, quantifying rates of NCD in these settings is important and provides valuable information for policy makers and researchers. Given the insight into health, this information provides, the WHO has collated extensive data on NCD for many years. The majority of this information centres around NCD related mortalities. However, projected health estimates and

years lost to disability are also available (WHO, 2015). Health trends in the UK for males and females are monitored by the British Heart Foundation (BHF) Centre on Population Approaches for Non-Communicable Disease Prevention. In keeping these records, it has enabled a general consensus on the main NCD affecting health to be established. These include diabetes, CVD, RD and cancers. In the next section these four conditions will be reviewed at a global, national and local level. In doing so, the extent of these problems within varying contexts will be highlighted. The implications of menopausal status on the main four main NCD are discussed in section 2.4.4.

2.3.1 Global burden

According to the WHO (2012b) 56 million deaths were reported worldwide, 38 million of these were due to NCD (i.e. CVD, diabetes, cancers and RD) of which 18 million were female mortalities (WHO, 2012). Data provided by the WHO shows that NCD are the main cause of morbidity and mortality for women across all WHO regions, except for the African regions where communicable diseases remain the leading health problem. However, even in the African Regions NCD are rising rapidly. A recent report indicated that Europe had the highest number of population mortalities as a result of NCD (WHO, 2012), with women contributing significantly to mortality rates (WHO, 2012). This trend is set to continue over the next 15 years with Europe predicting 88.9% of mortalities to be linked with NCD by 2030 (WHO, 2013). In relation to Years Lost due to Disability (YLD), global statistics for 2012 show that woman are more likely to lose additional years to disability than men. Health estimates for women project an additional 5,917,739 deaths due to NCD by 2030 (WHO, 2015), YLD are also expected to rise steadily in future years (WHO, 2014).

Cardiovascular diseases: Conditions such as coronary heart disease, cerebrovascular disease, peripheral arterial disease, raised blood pressure, rheumatic heart disease, congenital heart disease and heart failure are the group of diseases referred to as CVD and are the most common conditions affecting women worldwide (WHO, 2016), accounting for approximately 9.1 million deaths each year. Europe has the second highest rate of mortalities and YLD due to CVD after the Western Pacific region (WHO, 2013; 2014). In Europe, CVD account for approximately 45% of female mortalities each year, by 2030 rates are projected to rise by 24% (WHO, 2015). Dietary changes, smoking habits and decreasing levels of PA play a specific role in projected trends.

Cancer: Cancer is described as a rapid development of abnormal cells that can affect any part of the body and grow beyond their usual boundaries. These cells can grow and spread to multiple organs within the body. The most common form of cancer reported among women is breast cancer. According to the WHO approximately 3 million deaths each year are as a result of cancers. Cancer mortality rates are expected to rise 41% worldwide by 2030 with protected mortalities due to breast cancer expected to be highest in the South East Asia region followed closely by Europe (WHO, 2015). According to 2012 estimates, the European region had the highest rates of YLD due to breast cancer followed by America with the African region having the lowest (WHO, 2015). It is argued that the ageing population is contributing to this trend.

Diabetes: For women, diabetes mellitus can take the form of type 1, type 2 or gestational diabetes (GDM). Type 2 diabetes is related with a high Body Mass Index (BMI) which is calculated by dividing a person's weight (Kgs) by their height^2 (m^2).

The following classifications for BMI are normally adopted; normal range 18.5 – 24.99 kg/m^2, over weight 25 – 29.99 kg/m^2 or obese >30 kg/m^2. Notably, the most prominent form of diabetes within the population is type 2. Given the link between BMI and diabetes (i.e. type 2), the prevalence of this condition is expected to rise in future years, particularly within western societies as obesity increases. Type 1 diabetes occurs when the pancreas does not produce enough insulin which results in individuals with type 1 diabetes being insulin dependent. To date, the underlying cause of type 1 diabetes in unknown and the condition cannot be prevented. GDM only affects women as this condition occurs during pregnancy as a result of glucose intolerance (WHO, 2016). GDM is a particular concern for women as approximately 50% of those who have developed GDM are diagnosed with type 2 diabetes in the future. Approximately 143 million women worldwide have diabetes (WHF, 2011) and in 2012 it was the fifth leading cause of mortality (WHO, 2016a). When comparing regional data, the African region has the highest age standardised mortality rate for women while the European region has the lowest. According to global health estimates mortalities as a result of diabetes are expected to rise by 60% from 2015 to 2030 among women worldwide (WHO, 2013). In Europe, YLD due to diabetes is the third highest across all WHO regions with the African regions reportedly experiencing the lowest in 2012 (WHO, 2014).

Respiratory diseases: RD develops when the airways are obstructed and includes chronic obstructive pulmonary disease (COPD), asthma, respiratory allergies, occupational lung diseases and pulmonary hypertension. Estimates for YLD reported in 2012 showed that the European region had the third highest proportion of YLD due to respiratory diseases. COPD is the main respiratory disease among women killing more than 3 million people and accounts for the majority of YLD. Studies show that

a higher proportion of patients with confirmed asthma are women, possibility as many as 300 million and in Europe asthma closely follows COPD in relation to main conditions influencing YLD. Global health estimates suggest that mortalities as a result of respiratory diseases are projected to increase by approximately 37% among women worldwide by 2030.

2.3.2. National and local burden

Cardiovascular diseases: A recent report provided by the British Heart Foundation [BHF] (2014) provides national and local level data on mortality rates in the UK. According to the report, CVD accounts for approximately 83,202 mortalities among women in the UK. Adults under 35 years account for the lowest proportion of overall mortalities (i.e. 247) with significant increases evident during midlife (i.e. 3,141 deaths among women aged 55-64 years) and older adulthood, females aged 85+ (44, 499). In Northern Ireland, 8.8% of mortalities for females aged 18-35 years of age residing in NI were related to circulatory diseases, a figure that is higher than males. This increased to 14% and 23% for women aged 35-64 years and 65-84 years respectively. In addition, CVD account for 6.3% of all in-patient episodes among women. In the UK, the highest in-patient episodes for women were reported in Scotland whilst England had the lowest percentage of female in-patient episodes (BHF, 2014).

Cancers: There is some evidence to suggest that the main NCD affecting health in the UK is changing from CVD to cancer. However, at a national level this is not the case for women, as of yet (Bhatnagar, Wickramasinghe, Williams, Rayner & Townsend, 2015). Currently, 27% and 28% of mortalities in the UK are as a result of cancers and

CVD respectively (BHF, 2014). Breast, lung and bowel cancers remain the most common forms of cancer among women in the UK. The twenty most common cancers in the UK have increased by 8% since 2002-2004 figures were publish. Breast cancer has increased by 6% however the highest percentage change was noted for thyroid cancer (Cancer Research UK, 2016). The growing and ageing population in the UK has had an impact on cancers rates with a 35% increase from 2007 to 2030 expected (Mistry, Parkin, Ahmad & Sasieni, 2011). The NI cancer registry holds information relating to cancer trends and projections among males and females. According to data from 2009 to 2013, 4,275 women were diagnosed with cancer each year. This has increased considerably from 1993-1997 when 3, 189 cases were diagnosed annually. All cancers are increasing among women in NI with cancer rates are expected to rise 24% by 2020. By 2035 a 63% rise in cancer rates are expected among women in NI (Donnelly & Gavin, nd).

Diabetes: In the UK, the number of people diagnosed with diabetes is growing, with diabetes affecting 1.9% of the female population in 1994 compared to 2012, when 4.9% of the population were diagnosed with this health chronic condition. In the UK the gender split is approximately 50/50 with 5.3% of women diagnosed with diabetes. In Scotland 44% of Type 1 cases are women and 45% of Type 2 cases are women (NHS Scotland, 2010). A slightly higher rate of diabetes is apparent among women than men in NI with 54% of cases women (Department of Health Social Services and Public Safety [DHSSPS], 2006). High rates of obesity among women in NI may account for this trend.

Respiratory diseases: In the UK 42,226 deaths are as a result of respiratory diseases with higher inpatient episodes evident among women across the UK except for

England (BHF, 2015). Although death from respiratory diseases is lower than that of cancer and circulatory diseases, mortality from these diseases has increased by 41% from 1983 to 2013 for women. That is approximately 127 deaths per 100,000 populations for females. Chronic obstructive pulmonary diseases (COPD) are the fifth biggest killer disease in the UK. In addition, health statistics indicate that premature mortality from COPD was nearly two times higher than the European average and over 1.5 times higher for asthma. Asthma is also responsible for large numbers of hospital admissions (NHS England, 2016). In NI, 6.5% of female mortalities for women aged 35-64 years was due to respiratory diseases, this figure increased to 15% and 18% for women aged 65-84 years and 85 years + respectively.

2.4. Menopause

The ageing process coincides with biopsychosocial changes that have implications for health (Jasper et al. 2015). These changes commonly occur during key developmental phases throughout the life cycle. As change is already occurring developmental phases are seen as an opportunistic time to intervene to reduce health risks. The menopause is a normal biological event (Shifren, Gass & NAMS, 2014) that impacts on health and should be considered alongside the psychosocial context. As such a biopsychosocial approach to the menopause and the impact of the menopause has been advocated (Hunter et al. 2015). With regards to behaviour change, it is important to understand and identify differences during developmental phases that have the potential to impact on health and health behaviours. The research presented in this thesis acknowledges not only the biological stage of the menopause but also considers the wider context and the potential impact on a specific health enhancing behaviours.

2.4.1. Definition of menopause

The transition to menopause is signified by a reduction in ovarian follicular development eventually leading to the cessation of ovarian follicles (Barlow & Wren, 2005) and menses (NICE, 2013), known as menopause. As ovarian follicular cells deteriorate, hormonal changes occur which are characterised by a reduction in oestradiol, oestrogen and progesterone secretion levels (NICE, 2013). Evidently, the menopause is directly related to reproductive ageing and as such the female life course can be categorised into three distinct developmental phases referred to as pre-, peri- and post-menopause (Harlow et al. 2012).

2.4.2. Definition of pre-, peri- and post-menopause

According to Harlow et al. (2012), each menopausal phase can be characterised by the regularity of menses. "Pre-menopause" is referred to as the reproductive phase and characterised by regular menses. During the late reproductive phase subtle changes in flow and length occur. The term "peri-menopause" is referred to as the menopausal transition and represents the transitional time leading to the end of menstruation. The hormones produced by the ageing ovaries fluctuate during peri-menopause leading to irregular menstrual patterns. The duration of this phase differs among women however, peri-menopause usually lasts between three to five years and incorporates one year following menstruation cessation. Early menopause can occur when ovarian insufficiency leads to amenorrhea in younger women aged 40 to 45 years (Shifren, Gass & NAMS, 2014). "Post-menopause" is the phase of the life course following the menopause when a women experiences cessation of menses for > 12 months as a result

of ovarian cessation. The average age of natural menopause is 52 years however, this can vary from 40 to 58 years (Shifren, Gass & NAMS, 2014). Approximately 80% of women reach menopause by age 54. In some instances the menopause is surgically induced, this refers to the cessation of menstruation that occurs after a bilateral salpingo-oophorechomy, when both ovaries and fallopian tubes are surgically removed. A bilateral salpingo-oophorechomy causes menopause (cessation of ovarian follicle development) to occur and as such women regardless of age experience symptoms of the menopause.

2.4.3. Menopausal symptoms

Hormonal changes that occur during peri-menopause are linked to the onset of menopausal symptoms (Jane & Davis, 2013). Symptoms may be vasomotor, somatic and/or psychological. For example, night sweats, hot flushes, insomnia, crawling sensation on skin, vaginal dryness, anxiety, concentration problems and depressed mood (Hunter et al. 2012). Research in this domain is controversial with many studies suggesting that vasomotor symptoms are the only symptoms directly related to biological changes. However, it is possible that vasomotor symptoms indirectly influence psychological well-being during this time as symptoms such as stress, anxiety (including palpitations), depression, mood disturbances, irritability, difficulty concentrating and forgetfulness are frequently associated with the menopause (Rigg, 2012). Physical (somatic) symptoms such as feeling dizzy or faint, headaches, numbness, muscle and joint pain, headaches, loss of feeling in hands and feet and breathing difficulties are also commonly reported (Terauchi et al, 2013).

In the UK, the main symptoms reported by women are vasomotor symptoms such as hot flushes and night sweats (Palacios, Henderson, Siseles, Tan & Villaseca, 2010) and are the primary reason that women seek medical intervention during peri-menopause. Approximately eight in every 10 women will experience menopausal symptoms during the transition and up to 10 years post-menopause.

2.4.4. The impact of the menopause on health

Cardiovascular diseases: According to Colpani, Oppermann and Spritzer (2013) prevalence rates of CVD increase sharply in women following the menopause. Of women who develop CVD throughout the life course, 95% do so after the menopause has occurred. Previous research has linked hormonal and metabolic changes that occurs as a result of the menopause with an increase in CVD risk factors (Agrinier et al. 2010; Chang et al. 2000; Donato, Fuchs, Oppermann, Bastos & Spritzer, 2006; Matthews et al. 2009; Woodard et al. 2011). Given this, past research has been interested in reducing this risk through Hormone Therapy (HT). Research exploring the role of HT provides additional evidence for the increased risk of CVD following the menopause. For example, Schierbeck et al. (2012) explored the effect of HT on cardiovascular events in 1006 recently post-menopausal women. 502 women were randomly allocated to receive HT (treatment group) and 504 to receive no treatment (control group) with 10 years post intervention follow up. A reduced risk of mortality, heart failure and myocardial infarction was reported for women in the treatment group without any apparent risk of cancer. The decline in oestrogen levels and testosterone predominance as a result of the menopause has also be found to impair cardiometabolic

markers which increases the risk of CVD (Kilim & Chandala, 2013; Ramezani-Tehrani, Behboudi-Gandevani, Ghanbarian & Azizi, 2014).

Musculoskeletal conditions: Musculoskeletal conditions are widespread among adults with 17% of women aged 50-69 years developing musculoskeletal conditions. Although women peri- and post-menopause frequently suffer from osteoporosis, sarcopenia and osteoarthritis, the main musculoskeletal disorder affecting ageing women is osteoporosis (Van Dijk et al. 2015). This condition is characterised by a reduction of bone mineral density and micro-architectural deterioration of bone tissue, which in turn increases the risk of fractures. Over the years researchers have suggested that osteoporosis is as a result of menopause, as well as ageing, with changes in lifestyle factors, oestrogen and ovarian function linked with an increased risk of osteoporosis (Lane, 2006; Palombaro, Black, Buchbinder & Jette, 2013; Stevenson, 2011). In addition, Snyman (2014) argues that osteoporotic or fragility fractures increase with age, with the risk doubling every 10 years for women over 50. There is an increase in osteoclastic activity one year before the menopause however, osteoblastic activity does not continue to increase at the same rate with women, on average, experiencing a 10% reduction in bone mineral density (BMD) during the peri-menopausal phase. In some cases HT in the form of oestrogen with or without progestin is very effective in increasing BMD and reduces hip and other fractures by up to 50% (Tella & Gallagher, 2014).

***Cancer*:** Hormonal changes are associated with an increased risk of certain cancer (Dossus et al., 2010; Karageorgi, Hankinson, Kraft & De Vivo, 2010), particularly breast cancer (Hankinson & Eliassen, 2007; Kaaks et al. 2005). According to Awolaran (2015) oestrogen influences breast cancer progression as inhibition of

apoptosis and stimulation of cell proliferation occurs. Prolonged used of HT has been linked with an increased risk of breast cancer. Past research suggests that post-menopausal women are at an increased risk when using combined oestrogen-progestogen HT for more than three to five years. However, research suggests that using oestrogen HT without progestogen for up to seven years does not increase post-menopausal women's risk of breast cancer. In addition, a meta-analysis conducted by Liao et al. (2011) showed a 23% increase in risk of developing breast cancer among women diagnosed with diabetes.

***Diabetes*:** An increase in blood glucose has been linked with increased body fat following the menopause (Chae & Derby, 2011) and continues into the post-menopausal phase (Abdulnour et al. 2012; Davis et al. 2012), as a result of depleting ovarian function (Meyer, Clegg, Prossnitz & Barton, 2011). Currently, diabetes is one of the main conditions reported among post-menopausal women and is a known risk factor for CVD. The risk of diabetes during post-menopause was explored by a study conducted by Italia (2005). According to the results, these women were at a higher risk of type 2 diabetes after controlling for age. Low social economic status and being overweight were also found to predict diabetes rates. Given that weight gain is common as a result of the metabolic changes that occur following the menopause, women are more likely to be at an increased risk of diabetes during the post-menopausal years.

Respiratory diseases: It is suggested that hormones play a role in the development of respiratory conditions such as asthma (Bellia &Augugliaro, 2007). Given that asthma incident rates are increased following the menopause, and symptoms exasperated, for those already diagnosed with the condition, it is not surprising that HT has been used

as a treatment for asthma among post-menopausal women. However, the research in this domain is contentious with evidence suggesting that HT carries an increased risk of asthma (Troisi, Speizer, Willett, Trichopoulos, & Rosner, 1995). Nonetheless, previous research has acknowledged that risk of RD is increased with age, particularly following the menopause.

2.4.5. The impact of the menopause on psychological well-being

According to the Study of Women's health across the Nation (SWAN) depressive disorders increase during the menopausal transition (Bromberger et al. 2011). Over the years, many studies have highlighted that depression increases during the menopausal transition (Cohen, Soares, Vitonis, Otto & Harlow, 2006; Schmidt, Haq & Rubinow, 2004).

A review by Gibbs, Lee and Kulkarni (2012) noted that severity of vasomotor symptoms, hormonal fluctuations and health and lifestyle factors are predictive of depression during midlife. In addition low levels of PA, poor social support, changing psychosocial roles, chronic diseases and perceived loss of control have also been implicated as factors that influence psychological well-being (Almeida et al 2016; Brown, Ford, Burton, Marshall & Dobson, 2005). A randomised controlled trial conducted by Almeida et al. (2016), explored the role of health coaching in reducing depression in peri-menopausal women. The findings showed a decreasing trend in depression scores among the women in the intervention group. However, this finding did not reach significance. The authors concluded that it is difficult to reduce depression during the peri-menopausal years using health coaching. However, given

the psychological benefits of undertaking PA, it may be possible to reduce depression by increasing PA, particularly among women who are not undertaking the level of PA required to produce health benefits.

Some researchers believe that the psychological issues that occur during peri-menopause are not a direct result of biological changes but are consequences of vasomotor symptoms and additional changes that occur during this stage of the life cycle (Deeks, 2003). For example, lifestyle factors, changes in body image, interpersonal relationships, role and sociocultural factors. Nonetheless, it is difficult to dismiss that psychological issues arise at this time and have a negative impact on health and well-being, particularly within western societies. Furthermore, the psychological issues associated with the menopause can impact on women's self-confidence and decision making processes.

Furthermore, it is suggested that social changes (e.g. relationship with children; caring for an elderly relative; employment) and factors such as marital conflict, financial difficulties or the death of a friend/family member influences women's health during this phase of the life course. According to Ballard (2001), the menopause needs to be understood in the context of these changes, as these can enhance the negative effects of the menopause. Furthermore, these changes can influence an individual's social meaning and behaviours, such as PA. Despite the association between menopause, health, well-being and changing biopsychosocial factors few interventions are tailored to specifically target the needs of pre-, peri- and post-menopausal women with a view positive health behaviours such as PA.

2.5. Reducing the risk of non-communicable diseases across menopausal phases by undertaking PA

It is well established that engaging in PA, defined as "*any bodily movement produced by skeleton muscles that require energy expenditure*" has many health benefits including reducing the risk of developing NCD (Lee et al. 2012). As a result, health organisations and researchers have acknowledged that promoting PA is fundamental to the prevention and control of NCD (WHO, 2013). However in order to elicit the benefits adults should engage in recommended levels (see section 2.5.1). With regards to the menopause, being adequately active is particularly important as undertaking adequate levels of PA is thought to help prevent CVD and diabetes in menopausal women due to improved blood lipids and reduced body fat. PA also helps to improve fitness levels and muscle strength, both of which decline following the menopausal transition. Moreover, PA has been linked to a reduction in menopausal symptoms and can lift mood (Canario et al. 2012; Luoto et al. 2012).

Kolu, Raitanen, Nygard, TYomas, and Luoto (2015) conducted a randomised controlled trial to assess the cost effectiveness of a PA intervention for women with menopausal symptoms. The results showed that the intervention group had greater gains in cardiovascular fitness, lean muscle mass, and quality adjusted life years, when compared to the control group, thus, concluding that a PA intervention has the potential to be a cost effective method of reducing risk factors of NCD. Given that women post-menopause are at an increased risk of NCD, it is important that these women are undertaking health enhancing behaviours such as PA to prevent or delay the onset of these conditions.

2.5.1. Recommended levels of physical activity

Global recommendations on PA for health recognise that specific levels of PA are required to produce health benefits. Prior to 2011, adults (18-64 years) were advised to undertake 30 minutes of MPA on at least 5 days per week to produce the associated health benefits (Dubnov & Berry, 2005). As a result, a vast amount of data and research refers to these recommendations. However, in an attempt to allow more flexibility recommendations were altered in 2011. Currently, the WHO recommends that adults undertake at least 150 minutes of MPA or 75 minutes of vigorous-intensity physical activity (VPA) in bouts of 10 minutes or more, each week (WHO, 2010). In addition, adults should complete activities to improve muscle strength on at least two days each week and reduce the amount of time spent sedentary. These recommendations were endorsed by the four Chief Medical Officers of England, Scotland, NI and Wales. Consequently, these recommendations now represent current national and local PA guidelines (DoH, 2011). Thus, individuals failing to undertake at least 150 minutes of MPA with addition MSA on at least two days each week are not eliciting the benefits associated with undertaking PA.

2.5.2. Moderate/vigorous intensity

Intensity activities stimulate the body's cardio respiratory, musculoskeletal and metabolic systems and in turn promote health benefits. According to the WHO (2010) the Metabolic Equivalent of Task (MET) for moderate intensity activities is 3 to 6 METs. However, it is acknowledged that ultimately intensity is individualistic and dependent on factors such as fitness. MET rates can be difficult for individuals to

determine, particularly during activity for health. In an attempt to conceptualise intensity levels for public health, descriptions and potential intensity specific activities emerged in line with associated MET rates.

According to DoH (2011), MPA requires "*a moderate amount of effort that noticeably accelerates the heart rate*". This in turn causes adults to breathe faster, experience an increase in heart rate and feel warmer. Guidance provided by the DoH (2011) suggests that individuals undertaking MPA should still be able to carry on a conversation. MPA include: brisk walking, dancing, hoovering, cycling, house work and domestic chores, undertaking sports with children, walking pets and painting and decorating (Ainsworth et al. 2011).

Similar to MPA, VPA simulates some of the main systems within the body. However, vigorous intensity activities can bring health benefits over and above moderate intensity activities. According to the WHO (2010) vigorous intensity activities are more than 6 METs, requires a large amount of effort causing the heart to beat more rapidly, breathing to become much harder and body temperature to rise. The main distinction between the descriptions provided is that while completing vigorous activities individuals are unable to carry on a conversation. Example activities include: running, tennis, aerobic dancing, fast cycling, fast swimming, competitive sports and games.

2.5.3. Muscle strengthening activities

MSA are defined as activities that involve training with weights (or body weight). During these activities the muscles work or hold against a resistance. To contribute to

recommended levels of MSA, individuals should undertake MSA that involve all muscle groups (i.e. legs, abdomen, shoulders, hips, arms, chest and back) in one session. Completing two sessions per week is equivalent to meeting recommendations for health. Examples of MSA include: wall push ups; lunges; hip extensions and yoga exercises. Engaging in these types of activities can improve muscle strength, maintain functional ability, prevent a reduction in bone density and also has positive implications on glucose metabolism and blood pressure. However, in order to obtain the health benefits MSA should be completed until it would be difficult to complete another repetition, in addition to aerobic activities and on at least two days each week (DoH, 2011; WHO, 2010).

2.5.4. Global and regional levels of physical activity

Despite the benefits of PA, a large proportion of the population fail to undertake recommended levels. However, it should be noted that global and national statistics typically report levels of aerobic PA (i.e. at least 150 minutes of MPA), levels of MSA at a global and regional level are relatively unknown. Despite this, sex related disparities in aerobic PA is evident worldwide with females less likely to be active than men across all WHO regions (WHO, 2010). In 2010, 27% of women aged 18+ failed to undertake recommended levels MPA compared to 20% of men worldwide. Global rates for women increase to 55% amongst the oldest age group. Within the Eastern Mediterranean region, Saudi Arabia (68.7%) has the highest percentage of women who fail to meet recommended levels of MPA. In the America region, the lowest levels of PA among women was reported in Columbia (72.9), Argentina (42.7) and the United States of America (39.3) whilst Bangladesh has the lowest levels women meeting

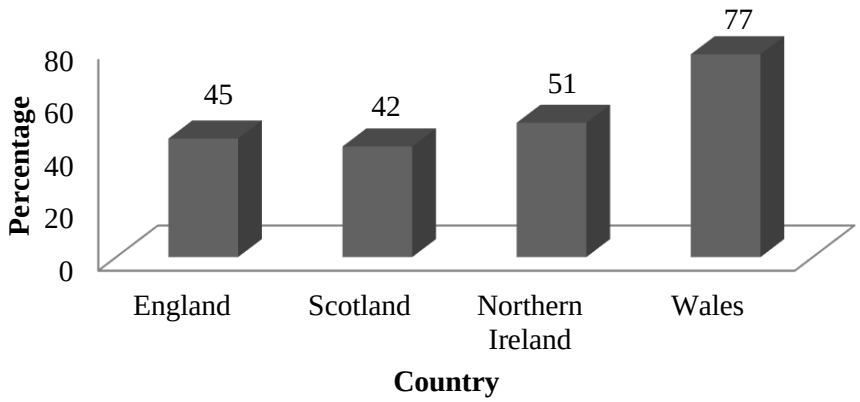
recommended levels of MPA in the South-East Asia region. Within the Western Pacific region, Malaysia has the lowest proportion of females undertaking this level of PA. In Europe, the lowest proportion of women undertaking recommended levels of MPA is apparent in Serbia and the United Kingdom (43.8% & 42.4% respectively).

2.5.5. National and local levels of physical activity

The British Heart Foundation, in collaboration with the British Heart Foundation Centre on Population Approaches for Non-Communicable Disease Prevention at the Nuffield Department of Population Health, University of Oxford, released PA statistics in 2012 and 2015 (British Health Foundations, 2012; 2015). These PA statistics do not refer to the proportion of the population meeting recommended levels of MSA. Thus, this section reports on the proportion of women undertaking at least recommended levels of MPA. The PA report published in 2012, indicated that Wales had the lowest proportion of women undertaking recommended levels of MPA followed by Northern Ireland, England and Scotland respectively (see Figure 2). Notably, the proportion of women undertaking recommended levels peaked between 25-34 years of age and 34-44 years of age across England, Scotland, Northern Ireland and Wales followed by an age related decline.

Statistics published in 2015 report that 45% of women in the UK fail to undertake minimum recommended levels of MPA with 51% of women living in NI failing to meet this level, compared to 45% in England and 42% in Scotland. Women living in Wales reported the lowest levels of MPA, with 23% meeting recommendations (British Health Foundation, 2015).

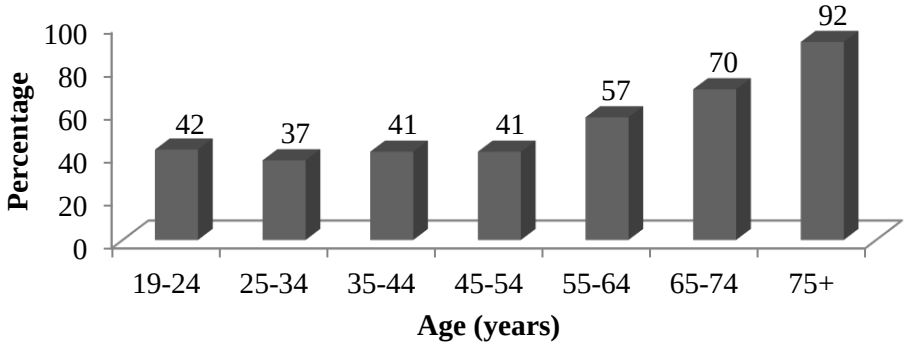
Figure 2.1: Percentage of women failing to achieve minimum recommended levels of MPA



Source: British Hearth foundation (2015).

According to the British Heart Foundation (2015) the number of women failing to meet recommended levels of MPA reduces slightly between the ages of 25-34, suggesting that these women are the most active. Although the percentage of women who fail to meet recommended levels of MPA increases between the ages of 35-44 years this remains the same between the ages of 45-54 years. However, the proportion of women in NI who fail to undertake recommended levels of MPA steadily increases as women reach 55 years of age and older.

Figure 2.2: Percentage of women in NI who are not meeting minimum recommended levels of MPA across the age ranges



To reiterate, this chapter highlights the literature that has directed the research included in this thesis and emphasised the need for interventions to increase women's participation in recommended levels of MPA and MSA. Furthermore, the present chapter has highlighted the need for these interventions to specifically focus on the menopausal transition, with a view to developing tailored programmes that account for biopsychosocial changes that occur throughout the life course. The next section focuses on the theoretical framework that will be used in this work.

2.6. Theoretical framework

Interventions to date have been heavily criticised for lacking a theoretical foundation despite widespread recognition that theory-based interventions are more likely to be effective (Abraham & Michie, 2008; Noar & Zimmerman, 2005; NICE, 2007; Craig et al. 2008). According to Michie, Johnston, Francis, Hardeman and Eccles (2008) there are three main reasons why adopting a theoretical framework is important. Firstly, causal determinants of the behaviour of interest can be identified. Secondly, theories of behaviour change can be evaluated and finally interventions using theory can facilitate an understanding of what works in practice.

Over the years, psychological theories such as the Transtheoretical Model [TTM] (Prochaska & DiClemente, 1986), the Health Belief Model [HBM] (Becker, Drachman & Kirscht, 1974) and the Theory of Planned Behaviour [TPB] (Ajzen, 1991) have been used to inform behaviour change interventions. The TTM suggests that people move through different stages when modifying behaviour and that stage transition is determined by *'processes of change'* (i.e. pros and cons; self-efficacy; decisional balance). Past research has used the TTM to design PA interventions (Hutchison, Breckon & Johnston, 2009) and explored intervention effects on TTM variables (Scruggs, Mama & Carmack, 2017). However, it is argued that TTM-based interventions have limited effects on PA, with few illustrating long-term behaviour change (Adams & White, 2004; Hutchison, Breckon & Johnston, 2009).

The HBM was developed by social psychologists to identify factors that influence preventative health behaviours. Over the years a plethora of research has utilised the HBM to obtain information on factors that influence breast and cervical screening and adherence to medical advice (Babazadeh et al. 2018; Dempster, Wildman &

Masterson, 2017; Guilford, McKinley & Turner, 2017). The HBM has also been used to understand factors that influence PA (Gristwood, 2011; Nowosielski, Hadzik, Gorna & Grabara, 2016) and inform educational interventions (Nourian, Kelishadi & Najimi, 2017; Rabiei et al. 2018). However, little is known about the effectiveness of PA interventions using this theory as most studies do not employ an objective measure of PA.

Over the years, the TPB has been influential in the field of health psychology. Ajzen (2011) argues that the TPB can identify and explain factors that influence people's decision to perform specific behaviours. Moreover, the theory suggests that behavioural intention can be increased by targeting factors found to influence the decision making process. Given the versatility of the TPB, this theory has been applied to a wide range of health behaviours including alcohol consumption (Cooke, Dahdah, Norman & French, 2014), diet (Close, Lytle, Chen & Viera, 2018), breastfeeding (Giles et al. 2007), dental hygiene (Davidson, McLaughlin & Giles, 2017), PA (Dean, Farrell, Kelley, Taylor & Rhodes, 2007; Shirvani et al. 2014; Vallance et al. 2011) and has been used to inform behaviour change interventions (Darker, French, Eves & Sniehotta, 2010; Hardeman et al, 2002).

The TTM, HBM and TPB are well established therefore, it is not surprising that a wealth of literature has utilised these theories. However, as the popularity of these theories increased, there limitations also became evident. As a result, the efficacy of the TTM, HBM and TPB has been debated over the years. For example, Davidhizar (1983) published a paper titled '*Critique of the HBM'* while Brug et al. (2005) provided a critique of the TTM. More recently, the TPB was the subject of much debate following a publication by Sniehotta, Presseau and Soares (2014) titled '*Time to retire*

the TPB'. Adams and White (2004) argue that TTM-based PA interventions have a limited effect on PA behaviour, suggesting that intervention components target previously defined '*processes of change*' which may not meet the needs of distinct population. Using alternative psychological theories such as the HBM and TPB would address this problem as these theories provide a framework for identifying factors that influence health behaviours. However, the HBM is criticised for lacking clear operational definitions of the theory constructs and failing to consider the social and environmental factors that influence health behaviours.

In contrast, the TPB provides guidance on how to operationalise the components of the theory and inform the design of TPB-based interventions (Ajzen, 2011; Ajzen & Fishbein, 2010). Despite this, the operationalisation of the TPB differs between studies which make it difficult for researchers to conclude on its efficacy. This issue has led to researchers calling for more standardised applications of the TPB. In addition, this theory provides an opportunity to identify social and environmental determinants of behaviour by exploring control beliefs and is considered mathematically better than the HBM and TTM (Taylor et al. 2006).

The volume of correlational studies using the TPB as a theoretical framework is criticised by Sniehotta, Presseau and Soares (2014). However, these studies provide support for the utility of the TPB. For example, in adults with type 2 diabetes the theory constructs explained 39% and 45% of the variance in intention to perform aerobic PA and resistance training respectively (Plotnikoff, Courneya, Trinh, Karunamuni & Sigal, 2008). Moreover, correlational TPB-based studies provide valuable information for researchers and practitioners on the determinants of health behaviours.

Admittedly, there are a number of issues with using the TPB to predict and explain intentions. Firstly, the length and repetitiveness of TPB-based questionnaires is believed to influence the quality of the data collected. Therefore, it is necessary to be mindful of this issue when designing a TPB-based questionnaire. Secondly, the linear nature of the TPB has been criticised. However according to Ajzen (2015), visual representations of the TPB have led to this misunderstanding. Thirdly, the constructs of the TPB do not explain all of the variance in intention, indicating that the theory constructs do not explain all of the factors that influence intention and in turn behaviour. The number of questions traditionally used to measure the theory constructs could account for this finding as subcomponents may not be fully represented within the model. Thus, measuring the components of the TPB separately could explain a larger proportion of the variance in intention. Finally, the intention-behaviour gap is often the subject of critical debate in relation to this theory. Behaviour change interventions can help address this issue by promoting the implementation of intentions.

Despite the problems associated with the TPB, it is well accepted that this theory has the potential to develop theory-based interventions that are tailored to meet the needs of subgroups within the population. Perhaps most importantly, this theory has been recommended to aid the development of complex interventions by NICE (Taylor et al. 2006). After considering the information outlined above, the TPB was viewed as the most appropriate theoretical framework to achieve the aims of this research. That is, the design and evaluation of an intervention to promote pre-, peri- and post-menopausal women's participation in recommended levels of MPA and MSA. Further information on the TPB is provided in the following subsection.

2.6.1. Theory of Planned Behaviour

The TPB emerged in 1985 after the Theory of Reasoned Action (Ajzen & Fishbein, 1980) was revised to include an additional construct termed perceived behavioural control (PBC). According to the TPB, human behaviour is determined by an individual's '*favourable or unfavourable evaluation of the behaviour'*, '*social pressure to perform or not perform the behaviour'* and '*perceived capability to perform the behaviour*' or '*perceived behavioural control'* (Ajzen, 2011). These underlying cognitions form the basis of a person's attitude, perceived subjective norms and PBC, which in turn determines an individual's behavioural intention. Within the TPB, intention is considered as a proxy for behaviour and as such assumes that behaviour is planned, in the sense that people take account of these factors before deciding to act (Ajzen, 2005). Traditionally, this theory has been used to identify and understand the factors predicting health behaviours. As a result the predictive ability of the TPB is well established. However, given that the TPB can identify important issues influencing behaviour and in turn inform the design of behaviour change interventions, the authors published information for researchers designing and evaluating interventions using the TPB as a theoretical approach (Ajzen, 2011; Fishbein & Ajzen, 2010).

The authors of the TPB suggest that the underlying cognitive processes guiding behaviour can be assessed indirectly by eliciting underlying behavioural, normative and control beliefs and directly by quantifying the TPB components (i.e. attitudes, subjective norm and PBC). Although attitudes, subjective norm and PBC are traditionally viewed as composite constructs it is well recognised that these constructs are an aggregate of two distinct components (Ajzen, 2002; Francis et al. 2004).

Attitudes comprise of affective (e.g. enjoyable/unenjoyable) and instrumental (e.g. benefical/harmful) attitudinal components while subjective norm is an aggregate of injunctive norm (i.e. "whether one believes it is important that others want them to perform the behaviour") and descriptive norms (i.e. whether one's social network performs a behaviour"). Similar to attitudes and subjective norms, PBC is a composite construct of self-efficacy (e.g. ease/difficultly, confidence) and controllability (e.g. personal control over behaviour).

In recent years, there has been a call for research distinguishing the sub components of the TPB in order to better understand the factors influencing PA. Research undertaken by Lawton, Conner and McEachan (2009) suggests that for many health behaviours, including PA, affective attitudes are a stronger predictor of intention than cognitive attitudes. Research by Conner, Rhodes, Morris, McEachan and Lawton (2011) provides further evidence for the superior role of affective attitudes within the PA domain with affective messages found to increase exercise. Subjective norm has not typically predicted intention to undertake PA well (Hagger et al. 2002). However it is possible that the composite construct of subjective norm fails to adequately measure the descriptive component, which may be more influential in a PA context. The conceptualisation of PBC has been controversial for many years. However, a wealth of research supporting the inclusion of self-efficacy within the TPB as a distinct component has emerged (Giles, McClenahan, Cairns & Mallet, 2004; Norman & Hoyle, 2004; Tolma, Reininger, Evans & Ureda, 2006).

Plotnikoff et al. (2008) explored the factors that influence aerobic PA and resistance training in adults with type 2 diabetes using a TPB-based questionnaire. The study identified attitude and descriptive norm as predictors of intention to perform resistance

training while attitude and injunctive norm were associated with intention to perform aerobic PA. Behaviour was assessed using the Godin Leisure Time exercise questionnaire with an additional question designed to measure resistance training. Notably, intention was related to aerobic PA but not resistance training. Participant's knowledge of resistance training may have accounted for this finding.

In 2009, Wing Kwan, Bray and Ginis used the TPB to understand the factors that influenced first year university student's decision to perform PA. In this study, participants were given a general definition of PA (i.e. engaging in activities of a moderate or vigorous intensity on 4 days per week for at least 30 minutes per day). Attitude and subjective norm were found to influence student's intention to perform PA. However, in contrast to the findings presented by Plotnikoff et al. (2008), PBC was also associated with intention.

Vallance et al. (2010) used the TPB to understand PA intentions and behaviour in post-menopausal women. This study adopted the two-component model of the TPB and assessed women's views on performing regular PA. Similar to previous research participants were given a definition of regular PA prior to completing the questionnaire. In this instance, regularly PA was defined as at least 20 minutes of vigorous intensity activity on at least 3 days per week or 30 minutes of moderate intensity activity on at least five days of the week. The findings showed that instrumental attitudes, affective attitude, descriptive norm and self-efficacy made unique contributions towards post-menopausal women's decision to perform regular PA, in turn, providing support for measuring subcomponents of the TPB separately.

More recently, Ferreira and Pereira (2016) explored the factors that influence PA and adherence in individuals diagnosed with type 2 diabetes. Participants completed a

TPB-based questionnaire designed to assess the theory constructs and measure their views towards walking for 30 minutes five times a week. The findings indicated that attitude made a unique contribution to the variance in intention and intention was associated with PA adherence. However, in contrast to the findings presented by Plotnikoff et al. (2008), PBC also contributed to the variance in intention and adherence.

It is well established that behavioural definitions of PA differ between studies making it difficult to compare the findings from previous research. Despite this, attitude followed by PBC has been identified as the strongest predictors of intention (Downs and Hausblans, 2005). Subjective norm is least likely to influence PA intentions however variability between subgroups of the population is apparent. Thus, in keeping with the assumptions of the TPB, it is imperative that researchers perform formative research when using the TPB to inform the design of an intervention.

2.6.2. Behavioural interventions using the Theory of Planned Behaviour

According to Fishbein and Ajzen (2010), the TPB provides a framework to explore the cognitive decision making processes that effect peoples' actions. It is these considerations that are thought to form an individual's intention to perform a behaviour and also provides information on the needs of the target groups. However, it is important to establish whether people have strong intentions to perform the behaviour as it may be necessary for interventions to incorporate behavioural strategies to aid implementation of intentions. The approaches adopted depend upon the cognitive decision making processes identified through formative research with a sub sample of

the target population, if there is enough volitional control, changes in behaviour will occur (Ajzen, 2011). The steps involved in designing an intervention using the TPB are discussed in section 2.7.

Over the years a number of interventions using the TPB with diverse populations have emerged. Hardeman et al. (2002) conducted a systematic review of these which targeted a range of health behaviours including PA. In total, 30 papers were eligible for inclusion although when the authors explored the effectiveness of these interventions; only 13 publications contained the information necessary to draw conclusion on this issue. Despite this, the authors were able to provide support for the application of the TPB. According to Hardeman et al. (2002) previous research lacks explicit information on how the theory was used within interventions while other studies use the TPB measures to identify determinants and explore differences pre and post-intervention. Consequently, few studies within their review used the theory to inform the intervention design. In relation to PA, only one study by Rodgers and Brawley (1993) used the theory to develop the intervention.

Recently, Gourlan et al (2016) published a meta-analysis of randomised controlled trials with a view to exploring the effectiveness of theory-based interventions promoting PA. In total, 82 interventions were included in the analysis with five theories represented within the review. The meta-analysis found no evidence to support the superiority of any one theory, suggesting that theory overlap may have accounted for this finding (Montanaro, & Bryan, 2014). Similar to Hardeman et al. (2002), the authors noted that determining efficacy was difficult as many studies do not adequately describe the methods used to change the theory constructs. Notably, the research included within the analysis did not always include all of the theory

components. However, since all of the constructs within a theory do not always influence behaviour change (Rhodes & Pfaeffi, 2010), construct selection is relevant following a rigorous process of formative research. Of the papers included, eight were identified as TPB interventions (Conner, Rhodes, Morris, McEachan & Lawton, 2011; Darker, French, Eves & Sniehotta, 2010; Godin, Belanger-Gravel, Amireault, Vohl & Perusse, 2011; Jones, Sinclair, Rhodes & Courneya, 2004; Kelley & Abraham, 2004; Kinmonth et al. 2008; Vallance, Courney, Plotnikoff, Yasui & Mackey, 2007). Although this research supports the use of the TPB within the PA domain it would appear that the issues outlined by Hardeman et al. (2002) remain prominent within TPB-based research.

Kelley and Abraham (2004) conducted an intervention using the TPB with a view to promoting healthy eating and PA. Participants were 252 out-patients (both males and females) over 65 years of age (M_{age}, 82 years). Participants allocated to the intervention group received a healthy living booklet whilst the control group received a patient satisfaction questionnaire. The healthy living booklet targeted the antecedents of behaviour as specified by the TPB and included goal setting prompts. During pre and post data collection a questionnaire was administered to assess the TPB constructs and behaviour (healthy eating and exercise). The results indicated that PBC and intentions for both behaviours were increased as a result of the intervention. Greater gains in healthy eating and PA were observed in the intervention group at the two week follow up.

Further support for TPB interventions is provided by Tsorbatzoudis (2005) who evaluated a 12 week school based PA intervention which included lectures and posters. The sample comprised of 366 high school students (both males and females). At

follow up, participants in the intervention had higher levels of intention, PBC and attitudes including exercise habits than the control group. Both of these studies used the TPB to evaluate the interventions and in the case of Kelley and Abraham (2004) the TPB was used to guide the content. In contrast to previous research, Kinmonth et al (2008) found no evidence to support the use of a TPB intervention among individuals at familial risk of diabetes (n=353).

Darker, French, Eves and Sniehotta (2010) developed a TPB-based intervention to promote walking in the general population. In total, 130 participants were recruited (males n=38, females n=92). In keeping with the operationalisation of the TPB, the intervention components selected were based on exploratory research conducted with the target population. From this, PBC was identified as the only component to predict intention. Consequently, the intervention contained components that targeted PBC and techniques that encouraged participants to fulfil their intentions to walk. Greater gains in attitudes and intention scores were also reported as a result of the intervention.

Many PA interventions have drawn upon the TPB and provide support for the application of this theory, particularly among clinical populations (Godin, Belanger-Gravel, Amireault, Vohl, Perusse, 2011; Jennings, Vandelanotte, Caperchione & Mummery, 2014). Godin et al. (2011) published a paper exploring the effects of completing a TPB-based questionnaire based on the level of activity in overweight/obese adults. In total 452 adults participated at baseline with 373 participants completing follow up data. The findings showed that PA participation was greater among participants in the experiential condition than those in the control condition. Thus, suggesting that completing a mere measure could promote PA in this cohort. Similarly, Jennings et al. (2014) found substantial increases in PA following

the completion of an online TPB-based intervention for adults with type 2 diabetes. Whilst Aparico-Ting et al. (2015) utilised the TPB to explore PA predictors following a 12 month supervised exercise intervention comprising of post-menopausal women. The results showed that recreational PA levels were influenced by self-efficacy and behavioural beliefs.

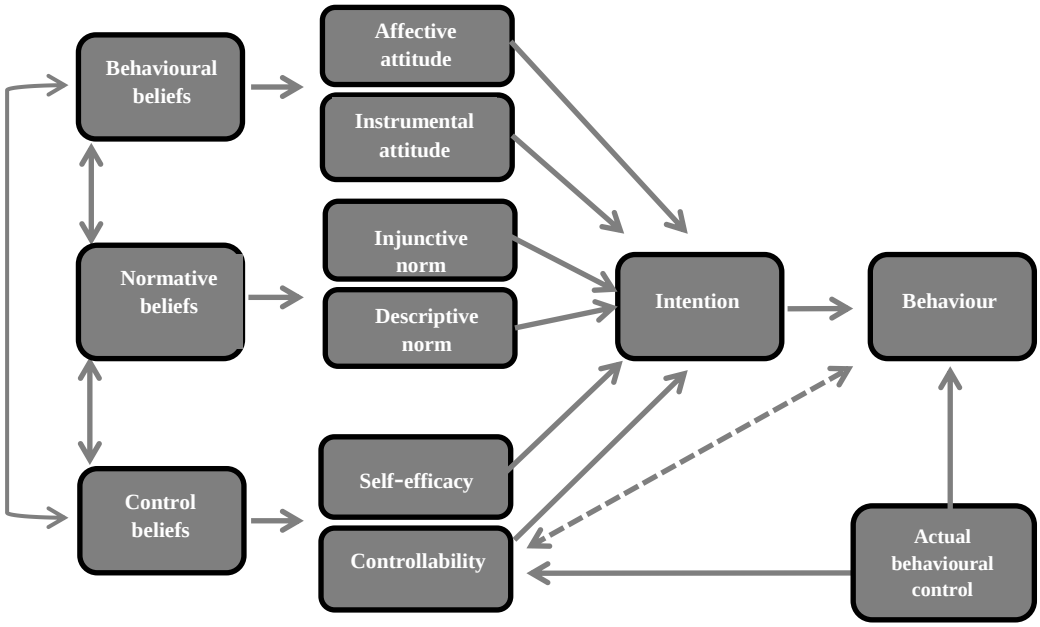
However it is evident that the methods used to develop and evaluate interventions using the TPB remain inconsistent. In addition, the majority of studies mentioned above relate to PA or exercise, but not specifically recommended levels with few published papers discussing interventions to promote MSA using the TPB. After exploring this literature two studies were identified (Pope, Lane, Tolma & Cornman, 2008; Fleig et al, 2016). Pope et al. (2008) conducted a study to promote strength and balance among frail older adults (male and female) in an assisted living facility (intervention group, n = 15; control group, n = 21). The constructs of the TPB were used to provide a framework to examine determinants of exercise during a qualitative assessment. Similarly, Fleig et al. (2016) used the TPB as a theoretical framework during a balance and strength exercise intervention for older adults. During the intervention, participants were introduced to balance and strength exercises, with two new exercises introduced during each session. Participants were also asked to set goals during each session. Knowledge, behavioural regulation and social factors were identified as factors that influenced the decision to undertake these exercises while participant's commitment, the session facilitator and group format were identified as key components of the intervention.

As illustrated in section 2.1 to 2.4.5, women are at risk of NCD due to biological and behavioural changes that occur alongside the menopause which are further impacted

by psychological and social changes. Thus, it is imperative that women are encouraged to undertake preventative health behaviours such as the recommended levels of MPA and MSA, particularly across menopausal phases to prevent or delay the onset of these conditions. Despite this, it is apparent from the statistics presented in this chapter that the proportion of women in NI undertaking recommended levels of MPA are amongst the lowest in the UK, with little known about the proportion of women undertaking MSA. It is well accepted that further theory-based initiatives to promote women's participation in these behaviours are required. It is clear from the TPB-based interventions described above that research strategies are yet to develop an intervention to promote pre-, peri- and post-menopausal women's participation in recommended levels of MPA and MSA using the TPB. Furthermore, few studies explicitly measure the distinct components within each TPB construct. Thus, as affective attitudes and self-efficacy in particular have emerged as key mechanisms in behaviour change, using the two component model of the TPB (Figure 2.3) has the potential to further explain the factors that influence intention.

Given that strategies to promote PA are yet to develop interventions targeting both MPA and MSA recommendations for women across menopausal phases using a two component model of the TPB, the research included within this thesis will contribute to this gap in the literature.

Figure 2.3: Theory of Planned Behaviour Framework used in this research



2.7. Research process

Given the above, the work included in this thesis will inform the design and evaluate the feasibility and acceptability of an intervention to promote pre-, peri- and post-menopausal women's participation in minimum recommended levels of MPA and MSA, using the TPB. In keeping with the advice of Ajzen (2011) and MRC guidance for developing complex interventions (Graig et al. 2008; Moore et al. 2015), the intervention design will be informed and evaluated based on the findings from three sequential research phases: (1) a qualitative exploration of the target populations attitudes and motivations towards undertaking these behaviours; (2) a TPB based survey to identify and explain the factors that influence the target populations intention towards performing these behaviours and; (3) a randomised controlled trial,

implementing the TPB-based intervention and evaluating its feasibility and acceptability. Consequently, this work employs a mixed method multiphase research design (Creswell, 2003) and involves three sequential research phases. The following subsections provide a summary of the aims and objectives for each phase in the research process.

2.7.1. Phase one

The first phase in the research process aims to explore women's attitudes and motivations towards undertaking minimum recommended levels of MPA and MSA using the TPB. The findings were drawn upon to inform the intervention design and a TPB-based questionnaire, administered in the second phase of the research process. To achieve these aims, the objectives of this research are to: (1) gain a better understanding of the cognitive processes that form pre-, peri- and post-menopausal women's attitudes and motivations towards undertaking MPA and MSA; (2) identify the behavioural beliefs that influence pre-, peri- and post-menopausal women's attitudes and motivations to undertaking MPA and MSA; (3) identify the normative beliefs that influence pre-, peri- and post-menopausal women's attitudes and motivations to undertaking MPA and MSA; (4) identify the control beliefs that influence pre-, peri- and post-menopausal women's attitudes and motivations to undertaking MPA and MSA; (5) to determine if the behavioural, normative and control beliefs that influence pre-, peri- and post-menopausal women's attitudes and motivations to undertaking MPA and MSA differ based on menopausal status.

2.7.2. Phase two

The second phase in the research process aims to explain and identify the TPB components that influence pre-, peri and post-menopausal women's intention to undertake minimum recommended levels of MPA and MSA. To achieve this, a TPB-based questionnaire was constructed drawing upon the findings from the first phase in the research process and advice provided by Ajzen (2002) and Francis et al. (2004). The TPB-based questionnaire is administered to a subsample of the target populations. Thus, the objectives for this research phase are to: (1) identify the underlying beliefs that influence pre-, peri- and post-menopausal women's intention to undertake MPA and MSA; (2) determine if any significant differences in mean scores exists between pre-, peri- and post-menopausal women on each of the TPB components directly assessed in the questionnaire; (3) identify the components of the TPB that significantly predict pre-, peri- and post-menopausal women's intention to undertake MPA and MSA.

2.7.3. Phase three

The final phase in the research process aims to design, implement and evaluate the feasibility and acceptability of a TPB-based intervention to promote pre-, peri- and post-menopausal women's intention to participate in minimum recommended levels of MPA and MSA. The research objectives are as follows: (1) to identify the intervention components based on the main findings from phase one and two of the research process; (2) to record enrolment, inclusion, withdrawal and attendance figures during the recruitment and implementation process; (3) to determine if mean scores

for the TPB components targeted within the intervention increased in pre-, peri- and post-menopausal women; (4) to determine if the intervention increased pre, peri- and post-menopausal women's mean scores on the remaining TPB components; (5) to determine if the intervention increased pre-, peri- and post-menopausal women's PA levels, specifically MPA and MSA as a result of the intervention; (6) to gain a better understanding of pre-, peri- and post-menopausal women's views on the intervention and intervention components.

Having discussed the literature, statistics and research process that directed the work included in this thesis, the next chapter (i.e. Chapter three) presents the first phase of the research process.

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Chapter Three

Exploring attitudes and motivations towards undertaking minimum recommended levels of moderate physical activity and muscle strengthening activities in a study of pre-, peri- and post-menopausal women using the Theory of Planned Behaviour

3.0. Abstract

Background: The large proportion of women, who are failing to meet recommended levels of moderate physical activity and muscle strengthening activities across menopausal phases, is a major health concern. The present study aimed to understand the cognitive decision-making processes that influence pre-, peri- and post-menopausal women's attitudes and motivation towards performing these behaviours in the context of the Theory of Planned Behaviour.

Methods: This study employed qualitative methodology involving focus groups and interviews. In total, six focus groups (pre-, n=2; peri-, n=2 and; post-menopausal, n=2) and nine interviews (pre-, n=3; peri-, n=4; post-menopausal, n=2) guided by the Theory of Planned Behaviour were conducted with 35 women aged 18 -64 years of age. All focus groups and interviews were tape recorded, transcribed verbatim and analysed thematically using a deductive approach.

Results: Pre-, peri- and post-menopausal women held positive attitudes towards undertaking recommended levels of moderate physical activity. Their attitude and motivation to perform this behaviour was influenced by a range of beliefs that were consistent across groups (e.g. physical and psychological benefits; family members; time constraints and; lack of motivation). However, the findings also highlighted distinct beliefs (e.g. social interactions; accountability to others and; concern for personal safety). Pre-, peri- and post-menopausal women held negative attitudes towards undertaking recommended levels of muscle strengthening activities. This finding was primarily influenced by a clear lack of knowledge on recommended levels and how to perform these activities.

Conclusions: The findings suggest that an intervention to promote pre-, peri- and post-menopausal women's level of moderate physical activity should be tailored to reflect key considerations based on menopausal status. In relation to undertaking muscle strengthening activities, the results illustrated the need to significantly increase women's knowledge of these activities.

3.1. Introduction

As highlighted in Chapter two, rising rates of non-communicable diseases (NCD) continue to be a major concern for women's health and service provisions. As a result, preventing rates of these conditions has become a major health priority. Given this, policy makers have emphasised the importance of developing interventions that adopt a life course approach and promote the recommended levels of physical activity (PA) required to produce health benefits (i.e. at least 150 minutes of MPA each week with additional MSA on at least two days each week). However, to reduce health disparities it is particularly important that these interventions are designed to target populations "*at risk*" of developing these conditions.

In recognition of this, the work in this thesis aimed to develop and evaluate an intervention to promote pre-, peri- and post-menopausal women's participation in recommended levels of MPA and MSA using the TPB. However, when using the TPB as a theoretical foundation for the development of interventions, it is important to explore the issues that influence the target population's decision to perform the behaviour of interest. In this case, the factors that influence pre-, peri- and post-menopausal women's decision to undertake at least 150 minutes of MPA each week and MSA on at least two days, per week. These issues can be understood by exploring the cognitive processes that form people's attitudes and motivations towards performing these behaviours (Ajzen, 2011; Sutton, 2010). It is suggested that obtaining this information will provide an in depth understanding of the cognitive determinants that affects the behaviours under investigation. Thus, in turn, informing a multilevel intervention that reflects the target group's needs.

According to the TPB, the cognitive processes that influence people's attitudes and motivations can be understood in the context of behavioural, normative and control beliefs (Ajzen & Fishbein, 2010). Past research has drawn upon the TPB to identify the beliefs that influence people's decision to undertake PA, these studies are commonly referred to as elicitation studies with the literature (Conn, Burks, Pomeroy, Ulbrich & Cochran, 2003; Conn, Tripp-Reimer & Mass, 2003; Belanger-Gravel, Godin, Bilodeau, Poirier & Dagenais, 2012; Blue, Marrero & Black, 2008; Downs & Hausenblas, 2005; Ellis, Kosma, Cardinal, Bauer & McCubbin, 2007; Gardner & Hausenblas, 2005; Hamilton & White, 2010). However, few to date have explicitly targeted women or focused on both aspects of the PA recommendations (i.e. MPA and MSA).

Downs and Hausenblas (2005) conducted a systematic review of elicitation studies using the TPB to understand the issues that influence the decision to perform PA. In total, 47 papers were found to have explored beliefs towards exercise using the TPB. The review identified improved physical and psychological health, family members and physical limitations as the main behavioural, normative and control beliefs towards exercise. However, of the 47 TPB studies included, only eight explicitly targeted females with none specifically comprising of women at various menopausal phases. While this study collates early research in this area it is difficult to conclude that the issues identified would be considered important among distinct female samples as these studies comprised both males and females.

Courneya and Friedenreich (1999) found that female cancer patient's attitude and motivations to perform PA were influenced by: having an opportunity to get their mind off their cancer treatment and experiencing illness. While improvement in emotional

functioning, pain and disability associated symptoms were important considerations for males and females with physical disabilities, when deciding to undertake PA (Ellis et al. 2007). Blue, Marrero and Black (2008) found affective elements (e.g. doing MPA or VPA I like) to influence PA behaviour among adults at risk of Type 2 diabetes. While, Hamilton and White (2010) found slightly different beliefs among mothers and fathers of young children, these included: improved parenting practices and, work and family commitments. From this, it is apparent that attitudes and motivation can differ among diverse populations. Although previous TPB-based research supports this view, issues such as: psychological and physical health benefits; doctors; spouse/partner and health matters are consistently reported within PA research irrespective of the target population.

To date, Belanger-Gravel et al. (2012) is the only study to explore the behavioural, normative and control beliefs specifically influencing the decision to undertake current recommended levels of MPA. The study was conducted with overweight/obese older adult populations. Consistent with previous research the results found improvements in fitness, general psychological wellbeing, family members and health problems as key beliefs. Population specific beliefs included weight control, time management, exercising alone and seeing the benefits.

There is an apparent dearth of research relating to MSA as previous research efforts have focused primarily on PA, exercise or the aerobic aspect of the PA recommendations. Consequently, little is known about the cognitive determinants of undertaking MSA. Given that rising rates of musculoskeletal conditions are contributing to the prevalence of NCD in women (Murray et al. 2012) and factors such as the menopause are contributing to this trend (Van Dijk et al. 2015), it is particularly

important that women are undertaking this behaviour to achieve the associated benefits (DoH, 2011; Hurley & Roth, 2000).

After reviewing the literature in this domain two studies were identified as exploring the determinants of strength training (O'Dougherty et al. 2008; Nazaruk, Tedders, Alfonso &Vogel, 2016) however, the TPB was not used to guide these studies. O'Dougherty et al. (2008) conducted a strength training intervention and explored the factors that influenced adherence. Participants were women aged 25-44 years and classified as overweight to mildly obese. The results found that family and work obligations; transitional life events; negative perceptions; accountability; body image/weight loss; commitment and; feeling guilty influenced woman's decision to undertake MSA. More recently, Nazaruk et al. (2016) found that a lack of knowledge, lack of skill, previous sports participation and the perceived effect of strength training on appearance were linked with participation among women of a similar age.

Evidently research is yet to explore pre-, peri- and post-menopausal women's attitudes and motivation towards undertaking recommended levels of MPA and MSA using the TPB. Given this, and the guidance provided by Ajzen (2011) on developing a TPB-based intervention, further research in this area is warranted. In addition, exploring the issues that influence women's decision to perform recommended levels of MPA and MSA across menopausal phases provides an opportunity to understand women's attitudes and motivations at key transitional stages that can impact the determinants of PA on multiple levels. From this, interventions can be tailored to meet the needs of these populations.

However, it is notable that the most effective method of obtaining this information has been disputed in recent years and should be considered prior to conducting this

research. Traditionally open ended questionnaires were considered the most effective method; consequently past research has adopted this approach (Courneya, & Friedenreich, 1999; Ellis et al. 2007). However, in recent years there has been an influx of research using focus groups and interviews to collect this information (Belanger-Gravel et al. 2012; Davidson, McLaughlin & Giles, 2016; Hamilton & White, 2010).

3.1.1. Aim

The aim of the research presented in this Chapter was to explore pre-, peri- and post-menopausal women's attitudes and motivations toward undertaking recommended levels of MPA and MSA using the TPB.

3.2. Methodology

3.2.1. Design

Qualitative methodology (Sandelowski, 2000) involving focus groups and interviews were used to achieve the aim of this research. Although qualitative methodology, involving focus groups/interviews is not typically used to identify attitudes and motivations in the context of the TPB, previous research has adopted this approach (Hamilton & White, 2010; Widayati, Suryawati, de Crespigny & Hiller, 2012). It is argued that this approach allows more in-depth information to be obtained (Holloway & Wheeler, 2016). Obtaining in-depth information enhances our understanding of the

underlying cognitive processes driving the behaviour under investigation which is fundamental to the success of tailored interventions.

3.2.2. Participants

Purposeful sampling techniques (Patton, 2002) were used to recruit participants from Ulster University and community groups in Northern Ireland (NI) to one of three menopausal groups (i.e. pre, peri- or post-menopausal). Staff and students from Ulster University (Belfast; Coleraine; Magee; Jordanstown campuses) were recruited via email. The email contained information on the study and the researchers contact information. Individuals interested in partaking were asked to contact the researcher by return mail. Recruitment also took place at community organisations that serve women (n=5). A short talk on the research and what would be involved by participating was provided. Those interested in participating were asked to express an interest to the researcher at the end of the talk.

In total, thirty-six women were recruited to this study. Characteristics of menses and age were used to determine menopausal status. Inclusion criteria were as follows: women <48 years of age reporting regular menses were included as pre-menopausal; women >40 years of age but less than 55 years reporting irregular menses were included as peri-menopausal; and women reporting cessation of menses for >12 months due to the menopause were included as post-menopausal. Menopausal status for participants reporting a hysterectomy or use of contraception was determined based on the following criteria: pre-menopausal, <48 years; peri-menopausal >48 years but <55 years of age; and post-menopausal >55 years. Exclusion criteria were as follows:

(1) early menopause defined as cessation of menses < 40 years; (2) self-reported bilateral salpingo-oophorectomy.

3.2.3. Measures and materials

A questionnaire was used to collect information on participant characteristics and an interview schedule drawn upon to guide the focus groups and interview discussions (see Table 3.1). The questionnaire had two sections, section one was designed to collect demographic information including characteristics of menses. Section two assessed PA levels.

Section one: demographic information

Section one included seven items, the questions included: "Please state your age in years", "please indicated your highest level of education" (i.e. primary, secondary, college or university level), "please indicate your relationship status" (i.e. married, in a relationship, single, windowed or divorced), "how long has it been since your last period" (i.e. 1-3 weeks, 1.-6 months, 7-12 months, 1-3 years or 3-5 years), "would you describe your period as" (i.e. regular, more irregular than normal, have always been irregular or have stopped all together) and " If your periods have stopped what are the reason" (i.e. hysterectomy, menopause, thyroid, diabetes, contraception, pregnancy or other).

Section two: PA levels

The International Physical Activity Questionnaire – Short Form [IPAQ-SF] (7 day recall) was included in section two of the questionnaire to assess PA levels. The IPAQ-SF is a standardised questionnaire that is widely used and has adequate levels of reliability and validity (Craig et al., 2003; IPAQ-SF, 2003). The IPAQ-SF comprises seven questions and examines levels of VPA, MPA, time spent walking and time spent sitting. Three items are designed to assess the number of days respondents participated in each type of activity. While a further three standardised items measure how much time respondents spent doing these activities on one day. In order to obtain information on time spent sitting respondents are asked how much time they spend sitting on one day, during the past seven days. Responses were scored according to the IPAQ-SF scoring protocol and categorised as one of the following: inactive; minimally active; or highly active (IPAQ, 2005). Consistent with previous research using the IPAQ-SF to identify PA levels in line with recommended levels of PA (Murtagh, et al. 2015), the highly active category was used as a proxy for undertaking at least 150 minutes of MPA in the past week

Focus groups/interviews

The schedule presented in Table 3.1 guided the focus group and interview discussions. This schedule contained a series of open ended questions that were designed in line with guidance provided by Francis et al (2004) and reflect the target group, action and time elements of the TACT principles used in TPB research (i.e. target group, action, context and time). The context was not included in the operational definition of these questions as this study was not exploring PA within a specific context. As a result, the action element for each question was enhanced. A semi-structured approach was

adopted during the focus groups/interviews thus, allowing self-arising issues that weren't included in the original schedule to be discussed.

3.2.4. Procedure

This study was advertised at community organisations in NI that serve women. To achieve this, a purposeful sample of community organisations were informed about the study by phone or email and asked if the researcher could attend groups within these organisations to advertise the study. The researcher attended five groups that agreed to support this study and provided a short talk on the purpose of this research and what would be involved by participating. At the end of the talk, the information sheet was disseminated and those considering taking part were advised to express an interest in person to the researcher. An opportunity to ask questions was provided and consent was obtained from those agreeing to participate. Once consent was obtained, participants were asked to complete a short questionnaire and return this to the researcher.

As recruiting midlife women to this study proved difficult through community organisations, the recruitment strategy was amended to allow recruitment to take place at Ulster University. Both staff and students were invited to take part via email and asked to contact the researcher by return mail if they would like further information or to participate. Those who expressed an interest were emailed the information sheet and asked to meet with the researcher at Ulster University to discuss whether they would like to consent to partake. During this meeting, the purpose of this research and what would be involved was discussed. Those willing to participate were asked to

complete and return the consent form to the researcher. Once consent was obtained, a short questionnaire was given to participants who were asked to fill out the questionnaire and return it to the researcher during the meeting.

On completion, the questionnaire data were reviewed to determine participant's eligibility and menopausal status. Individuals meeting the inclusion criteria were originally invited to take part in a focus group based on menopausal status. However, it proved difficult to facilitate focus groups as participants were not always available at the same time. It was felt that conducting one to one interviews would address this problem, as a result, participants were provided with the opportunity to contribute to a focus group or interview. Focus groups and interviews took place at community venues and at Ulster University. The time frame between completing the questionnaire and contributing to the focus group/interview discussions varied. Some interviews were conducted once participants completed the questionnaire others were undertaken within one week of meeting with the researcher. Focus groups were conducted at a time convenient to everyone who had agreed to contribute to a group discussion, once this was established these individuals were contacted by email to confirm the venue, date and time.

At the beginning of each focus group/interview the researcher introduced themselves and discussed the purpose of the study. All participants were provided with a factsheet on the recommended levels of PA for adults. This information was discussed at the beginning of each focus group/interview to provide a context for the research questions. Before commencing the focus groups/interviews all participants were asked if they were willing to continue. They were also reminded that their contribution was voluntary and would be kept confidential. As multiple people were involved in the

focus groups, participants were reminded that the information discussed was confidential and should not be mentioned outside of the focus group. Participants were also asked to respect each other opinions; express their opinions whether they agree or disagree and; to try not to use any names. Following this, the audio recorder was turned on and the focus group or interview commenced.

The focus groups/interviews were guided by the questions presented in Table 3.1. When necessary, additional probe questions were used to obtain more in-depth information (Krueger & Casey, 2015), or questions were restructured for clarity. Recruitment continued until data saturation was reached (i.e. when no additional themes were emerging). Discussions lasted between 30 minutes and 1 hour 10 minutes, were audio recorded and transcribed verbatim.

3.2.5. Data analysis

Quantitative data were imputed into SPSS (version 22) and descriptive statistics used to determine participant characteristics. Qualitative data was analysed based on menopausal status. Given that the TPB was used as a theoretical framework, a deductive approach using thematic analysis was adopted to analysis the transcripts (Braun & Clarke, 2013). In line with this approach the transcripts were read several times to ensure familiarity with the information and initial observations noted in line with the aims of the project. Patterns in the data were identified and broad codes established and then refined. These codes and the relevant extracted data were assigned to corresponding theoretical themes (i.e. behavioural, normative and control beliefs). As focus groups and interviews were conducted the data was triangulated to

improve the validity of the results. A second researcher reviewed and coded a selection of the transcripts following the same analysis process. An inter-coder discussion took place until a general agreement was reached. An inter-observer agreement was also calculated by dividing the number of observed agreements by the number of judgements and multiplying the total by 100.

3.2.6. Ethical considerations

Ethical approval for this study was obtained from Ulster University, School of Psychology Post-graduate and Staff Research Filter committee. Once ethical approval was acquired, recruitment commenced. Potential participants were given an information sheet providing a detailed description of the study and procedures to ensure they were making an informed decision.

Written consent was obtained from all participants, thus, indicating their agreeing to take part in this research. Given this, anonymity could not be guaranteed. Pseudonyms were not used in this research however, participants were provided with a unique ID number to protect their anonymity. IDs were provided by the researcher facilitating the interviews/focus groups and a code book developed. This in turn provided participants with the opportunity to withdraw by informing the researcher and quoting their ID number. Participants could withdraw during the discussion or within 3 months of taking part. Information on how to withdraw was provided on the information sheet and all participants were reminded of this process at the end of their interview/focus group discussion.

It was acknowledged that partaking in this study may raise concerns about activity levels or the menopause. Therefore to reduce the risk of upset, participants received a factsheet on the recommended levels of PA and the menopause at the beginning of the interview/focus group. Participants were also informed at the beginning of the discussion that their contributions would be treated confidentially and stored securely at Ulster University for 10 years. All participants were advised not to use any names during the discussion but ensured that any names would be removed from the transcripts. Those participating in the focus groups were asked to respect each other's opinions and were informed that any views and opinions shared during the discussion should remain confidential and not be discussed outside the group.

During this study all data were handled in line with approved ethical procedures and data protection procedures at Ulster University. On completion of this thesis the data will be stored at Ulster University for 10 years.

Table 3.1

Focus group/interview schedule used to guide the focus group/interview discussions

Schedule
Introduction: The PA guidelines advise that adults aged 19-64 years undertake at least 150 minutes of MPA each week with additional MSA on at least two days each week. According to these guidelines MPA involves activities such as brisk walking "that cause you to feel warmer, breathe harder and makes the heart beat faster but you should still be able to hold a conversation with another person. MSA are physical activities that strengthen muscles and involve using body weight or working against a resistance. Activities include exercising with weights or carrying or moving heavy loads such as groceries. During this discussion we will ask you to share your views towards undertaking these behaviours, each week.
Behavioural beliefs - What do you believe are the advantages of completing (150 minutes of MPA/ activities to improve MS on at least two days), each week? - What do you believe are the disadvantages of completing (150 minutes of MPA/ activities to improve MS on at least two days), each week?
Normative beliefs - Are there any groups or people who would approve of you completing (150 minutes of MPA/ activities to improve MS on at least two days), each week? - Are there any groups or people who would disapprove of you completing (150 minutes of MPA/ activities to improve MS on at least two days), each week?
Control beliefs - What factors or circumstances would enable you to complete (150 minutes of MPA/ activities to improve MS on at least two days), each week? - What factors or circumstances would prevent you from completing (150 minutes of MPA/ activities to improve MS on at least two days), each week?

Note. The interview/focus group questions were developed based on the guidance provided by Francis et al. (2004). Behavioural beliefs refers to the likely consequences of performing the behaviour of interest (i.e. the advantages and disadvantages); Normative beliefs establishes the basis for perceive social pressure (i.e. individuals or groups who would approve or disapprove); Control beliefs refers to the presence of factors that facilitate or inhibit the behaviour of interest (i.e. existing facilitators and barriers present). As the interview/focus group questions were repeated for both modes of PA the sequence of items were counterbalanced to reduce the impact of order effect. Abbreviations: MPA = moderate physical activity; MS = muscle strength; PA = physical activity.

3.3. Results

The results were analysed with a view to determining participant characteristics and exploring the issues that influence pre-, peri- and post-menopausal women's attitudes and motivations towards undertaking recommended levels of MPA and MSA, using the TPB. As such, subsequent sections provide information on participant characteristics and discuss the themes and subthemes that emerged from the data. Themes and subthemes are presented by mode of PA (i.e. MPA and MSA). Following an inter observer calculation a general agreement of 94% and 96% was reached for MPA and MSA themes respectively.

3.3.1. Participant characteristics

Participant characteristics are presented in Table 3.2. In total, the study achieved a sample of 34 participants. Of the 34 women who participated, 15 were pre-menopausal (M_{age} = 32yr, SD=8.04), 8 peri-menopausal (M_{age}= 49yr, SD=2.25) and 11 post-menopausal (M_{age}=59yr, SD=3.33). The majority of pre- and peri-menopausal participants were educated to college level or above while less than 25% of post-menopausal women were educated to the same level. More than 50% of peri- and post-menopausal women were married (75% & 66% respectively) while the majority (50%) of pre-menopausal participants were in a relationship. In relation to PA levels, pre-menopausal women were least likely to be undertaking recommended levels of MPA while peri -menopausal women were most likely.

Table 3.2

Participant characteristics by menopausal status

	Pre n=16	Peri n=8	Post n=12
Age (*M)*	32 SD =8.06	49 SD =2.25	59 SD =3.33
Levels of education (%)			
Completed Secondary education	19	12	58
Completed College education	50	25	8
Completed University education	31	63	17
Missing	0	0	17
Marital status (%)			
Single	19	13	0
Married	25	75	67
In a relationship	50	0	0
Divorced	0	12	8
Separated	0	0	8
Missing	6	0	17

Note. Descriptive information on age, level of education and marital status was computed to identify participant characteristics. Age is presented as a mean while percentages are used to illustrate participant's level of education and marital status by menopausal group. Abbreviations: M = mean; *SD* =Standard Deviation; % = percentage; N=number; pre=pre-menopausal; peri=peri-menopausal and; post=post-menopausal.

3.3.2. Women's attitudes and motivations towards undertaking weekly recommended levels of MPA

The majority of women were familiar with previous recommended levels of aerobic PA (i.e. 30 minutes of PA, 5 times a week) but were unfamiliar with current recommendations referring to MPA (i.e. 150 minutes of MPA, each week). Nevertheless, women discussed the research questions with current recommendations in mind and had clear views and opinions toward undertaking this behaviour. As the TPB was used as a theoretical framework and a deductive approach to the analysis adopted, the main themes were behavioural, normative and control beliefs. Views and opinions found to influence women's attitudes and motivation towards performing the target behaviour are presented in this section in the context of the main themes.

3.3.2.1. Behavioural beliefs

In line with the TPB, the advantages and disadvantages of undertaking weekly recommended levels of MPA were considered as behavioural beliefs. During the analysis it became clear that the main behavioural beliefs fell into five categories: psychological and health benefits, weight control, social interaction and risk of pain/injury. However, these differed slightly based on menopausal status. In order to illustrate these findings, the main advantages and disadvantages are presented in turn with exemplar quotes.

Psychological benefits

The majority of pre-, peri- and post-menopausal women reported psychological benefits as an advantage of undertaking recommended levels of MPA, each week. For pre-menopausal women these included: feeling better; clearing your head and; feeling a sense of achievement. This finding is evidenced by the following quotes:

> "*It clears your head and it gives you thinking time instead a when you're stuck in the house the whole time you feel low*" (Pre, p23)

> "*You feel better in yourself"* (Pre, p4)

> "*It's very good for mental health as well*" (Pre, p24)

> *"An achievement, it has a sense of achievement aspect to it"* (Pre, p15)

Some pre-menopausal women suggested that the psychological benefits were particularly important for parents.

> "*Especially like say if you're a mummy to get out for an hour sorta clear your head*" (Pre, p8)

Peri-menopausal women felt that feeling better, having an opportunity to clear your head and de-stress were the main psychological benefits associated with undertaking recommended levels of MPA, with women stating that:

> "*It's for me to get into my own head and de-stress*" (Peri, p36)

> "*I think it just clears your head. It gets you away from everything else you're doing all the time*….(Peri, p37)

"*I think feeling good about yourself is one of the things it helps you with*" (Peri, p32)

In contrast to their younger counterparts, psychological benefits were not linked with parenthood. Despite this, it was clear that peri-menopausal women were highly motivated by the associated psychological benefits, with 100% of participants mentioning these as an advantage of undertaking MPA.

Post-menopausal women reported feeling better and a sense of achievement as advantages of undertaking MPA.

"*You definitely do feel better, you come home feeling uplifted*" (Post, p13)

"*You feel at least you have accomplished something. You've done something positive to help your own health*" (Post, p10)

It was also suggested that undertaking MPA would improve confidence.

"You feel more confident, you've more, you're more self-esteem, it helps your self-esteem" (Post, p10)

Thus, suggesting that improved mood, a sense of achievement and improved confidence may motivate post-menopausal women to undertake MPA. In contrast to their younger counterparts, post-menopausal women did not mention having an opportunity to de-stress and to clear their head as important psychological benefits. Nevertheless, it is apparent that emotion plays a key role in the decision to undertake MPA across menopausal groups.

Physical health benefits

Pre-, peri- and post-menopausal women recognised that meeting recommended levels of MPA produced physical health benefits. For pre-menopausal women, factors relating to physical health included healthy ageing and feeling physically fitter. This finding is reflected in statements such as:

> "*...there is the sort of general understanding of health benefits and the desire to remain reasonably fit as I get older*" (Pre, p38)

> "*…you would be a lot more fitter*" (Pre, p4)

Parenthood was mentioned as a motivational factor during discussions with pre-menopausal women. This finding was linked to ageing parental responsibilities.

> "*I want to be able to go and do things with them. Like whenever they're older I do, I would like to go for a run around the park with them*" (Pre, p16)

However, others felt that the physical health benefits were unlikely to motivate them to undertake this behaviour.

> "*You can be aware of the health benefits but it maybe wouldn't be the motivation or thrive to make you do it"* (Pre, p34)

Physical health benefits were also mentioned as an advantage among peri-menopausal women, with participant's making the following statements:

> "*Your body is obviously ageing all the time so if you can keep active now you're probably preventing problems in the future*" (Peri, p32)

"*Your physical health*" (Peri, p37)

"*Better health. Less risk of uh certain diseases like heart disease"* (Peri, P33)

Similar results were reported among post-menopausal women.

"*As you get older you want to keep yourself a wee bit fitter don't you*" (Post, p26)

"*You know, you realise that yes, if you do physical activity you are helping prevent certain chronic health conditions like diabetes, coronary heart problems, all those things*" (Post, p10)

Weight control

The majority of pre-menopausal women believed that undertaking recommended levels of MPA each week would result in weight loss.

"*Helps you lose weight*" (Pre, p4)

"*I know my aim at the minute. I have a stone to loss so I will be more active*" (Pre, p23)

With one participant stating:

It's the only thing that motivates me" (Pre, p19)

Weight control was particularly important for peri-menopausal women with all participants reporting either weight loss or weight maintenance as an advantage of undertaking weekly recommended levels of MPA.

"*Losing a little bit of weight is a nice bonus*" (Peri, p36)

"*Lose weight*" (Peri, p21)

"*Well I lost a lot of weight last year and I want to try and keep it off*" (Peri, p35)

Evidently, many pre- and peri-menopausal women are motivated to undertake MPA due to the perceived weight related benefits. However, undertaking this level of PA is unlikely to result in weight loss. Weight control was not mentioned as an advantage among post-menopausal women.

Social involvement

Pre-menopausal women considered social involvement an advantage of undertaking MPA.

"*I think it's very important for social reasons*" (Pre, p24)

"*It's a good way of mixing*" (Pre, p8)

The social benefits were linked with getting out of the house and having time away from children.

In contrast, peri-menopausal women frequently discussed how they preferred to do PA on their own, with women stating:

"*I prefer to do it on my own so I do. I think there is probably groups that you can join, walking groups or whatever, I know there's running clubs you can join but I tend to prefer to do it on my own"* (Peri, p35)

"I would walk on my own because I just like the peace and quiet and think this is my time" (Peri, p37)

For peri-menopausal women, it was apparent that this opinion was linked to the psychological outcomes and enjoying time on their own.

Post-menopausal women felt that having company would encourage them to undertake MPA. However, it's important to note that this finding was linked with confidence and considered a control factor rather than an advantage within the present study.

Risk of pain/injury

When asked to discuss the disadvantages associated with undertaking recommended levels of MPA the majority of participants felt there were no disadvantages of undertaking this behaviour.

"*Definitely no*" (Pre, p24)

"*Um, no disadvantages*" (Pre, p38)

However, some felt there was an increased risk of pain/injury.

"*It would hurt*" (Peri, p21)

This view was particularly evident among post-menopausal women.

"*So pain would be a hindrance there*" (Post, p10)

"*Well if I done too much, if I walked too far my knee would niggle*" (Post, p22)

3.3.2.2. Normative beliefs

Family members and health professionals were identified as relevant others who would think that participants should undertake recommended levels of MPA.

Family members

Pre-menopausal women suggested that their family members think they should perform MPA.

> *"Partner"* (Pre, p4)

> *"Well my husband"* (Pre, p38)

> *"Your family"* (Pre, p5)

However, others mentioned that the views of these individuals were unlikely to motivate.

> "*I think the decision must be made by the person*" (Pre, p24)

While some women did not consider their families approval as a key consideration, it was apparent that encouragement from these individuals increased their motivation.

> "*He does a lot of canoeing, he is sort of interested in outdoor stuff as well so we try to encourage each other*" (Pre, p38)

Similar views were expressed by peri- and post-menopausal women.

> "*My husband encourages me every night to go walking*" (Peri, p21)

> "*My husband is good at encouraging me to keep my running going*" (Peri, p37)

"If I was going to do it I would do it because I wanted to" (Post, p30)

"I'd think your family would because they'd want you maybe, or you hope they'd want you to be around as long as possible" (Post, p9)

Health professionals

Health professionals were reported as individuals who think women should undertake MPA, particularly among post-menopausal women.

"*Aye doctors would approve*" (Post, p22)

"*Well I think a doctor*" (Post, p13)

Despite this, further analysis showed that some of these women were unsure whether or not the views of health professionals would actually influence their decision to undertake MPA.

"*I mean you constantly hear messages that you should do more or I mean we all know that but I think if a doctor actually said to you personally to do more it would definitely"* (Post, p13)

"*But again if the doctor said to you, well you know you should you probably would then*" (Post, p14)

While health professionals were reported, the results suggest that their views may only motivate post-menopausal women when directly relatable.

3.3.2.3. Control beliefs

Participants provided a range of opinions about the factors that prevented or encouraged them to undertake MPA, these included: personal motives, accountability to others, PA opportunities at work and green space; time constraints, lack of motivation, seasonal factors, expense, concern for personal safety and current physical capabilities. These issues are discussed below with accompanying exemplar quotes.

Personal motives

Some pre-, peri- and post-menopausal women suggest that having a personal motive would encourage them to undertake MPA.

> "*Everyone wants to be fit and stuff but usually I do it just to….if I have a holiday coming up or something like that. I have a tendency to put on weight if I don't have a goal…I don't have something you know pushing me" (*Pre, p8)

> "*Maybe if I did have some particular goal at the end of it or something like that…or some goal I was working towards*" (Peri, p33)

> "*That's right. You have to have a reason for doing it*" (Post, p10)

While pre- and post-menopausal women recognised that planning and establishing a routine was important if they were to achieve their personal goals.

> "*A good timetable always helps*" (Pre, p8)

> "*The thing we have to do is consistency. You know like where're big fans of doing 150 minutes for maybe three weeks and then going jeez, can't do that*

anymore but if you actually were doing it and doing it more consistently" (Pre, p15)

"*And working out a plan for your week and doing it I suppose*" (Post, p14)

"*You need a different plan for each week because your weeks are not always the same*" (Post, p9)

However, post-menopausal women expressed concerns about adhering to a PA plan and suggested that their psychological wellbeing influenced whether or not they would complete their goals/PA plans.

"*Sticking to the plan and not to how you feel*" (Post, p10)

Accountability to others

Pre-menopausal women felt that feeling accountable to others would encourage them to undertake MPA. It was believed that being accountable to others placed more pressure on them to carry out planned PA.

"Just somebody not taking no for an answer, or you say well I can't really be bothered" (Pre, p18)

"*Well I definitely need somebody to give me that push. I need somebody cos it could be raining and I'll say I'll leave it tay tomorrow but my friend would be on the phone put up the hood, put on a hat, bring an umbrella you're going*" (Pre, p23)

"*So if there was some level of perhaps accountability*" (Pre, p15)

Being accountability to others did not appear to influence peri- and post-menopausal women's motivation to perform MPA.

PA opportunities at work

The majority of peri-menopausal women felt that they were more likely to undertake MPA if opportunities were available at work.

> "*I suppose if it was included in some way into my working day*" (Peri, p33)

> *"Unless it was incorporated into our work in that you know we are doing some sort of physical activity"* (Peri, p21)

The structure of these women's lives impacted this finding.

> *"If I don't do it at lunchtime and I get home at night I just, my time just disappears. And there's no way I'm going to go back out to start walking again" (*Peri, p35*)*

With some women suggesting a longer lunch break would enable them to undertake MPA at work.

> "*Allocating extra time to it*" (Peri, p33)

> "*If you got a longer lunch break on the assumption that you would you would go a walk you know that would maybe make it easier because you would be doing it within your working day*" (Peri, p32)

This finding was linked to peri-menopausal women's time constrains which were primarily linked to ageing parental responsibilities. Pre- or post-menopausal women were not motivated to undertake MPA by having opportunities at work

Green space

For peri- and post-menopausal women access to green space motivated them to undertake MPA, with some women discussing how changes in PA patterns can occur when access to green spaces is restsricted. This finding is illustrated by the following quote:

> "*I lived by the sea for seven years so it was a habit, I wanted to get out there every day and look at it and then I went to a city. I lived in the middle of those terraced streets and there was nothing, car fumes and it just wasn't a healthy environment to be out walking in and I wasn't comfortable and then that's what broke the habit*" (Peri, p33)

Others mentioned that the area they lived in contributed to their PA levels.

> "*I think the area you live in"* (Post, p10)

> "*I hate walking up the road and then just coming back down again*" (Post, p10)

> *"I love walking around the coast and I like walking on the beach"* (Peri, p34)

Thus, suggesting that environmental factors are an important consideration for peri- and post-menopausal women when deciding to undertake MPA.

Concern for personal safety

Concern for personal safety was identified as a barrier towards undertaking recommended levels of MPA in peri- and post-menopausal women. These women felt that there was a lack of safe footpaths.

> "*Lack of safe footpaths and all kinds of things put people off*" (Peri, p32)

> "*Well I wouldn't be able to walk were I walk on my own at night and it is a night time I have to do it*" (Peri, p21)

> "*It's not safe*" (Post, p9)

> "*I think it's living in the country, I think if you were living in the town you could walk. You would have streetlights and you wouldn't feel as isolated, you might feel safe enough going out to walk on your own, in the country I wouldn't consider it*" (Post, p13)

One women went on to discuss how a previous experience of walking alone impacted her PA.

> "*When I was out walking one night at six o'clock in the evening I might add two wee boys jumped in front of me and tried to scare me and I was frightened after that that's what stopped me after that*" (Post, p30)

Time constraints

There was a general consensus among women that time was the main factor that influenced their PA levels, with family and work commitments mentioned as the main constraints on time. This finding is evidenced by the following quotes.

"*Cos you have suppers to make, lunches to make, homework's to do, bedtime, washing for me it's just by the time you look it's nine o'clock at night and you're thinking where'd your day go*?" (Pre, p23)

"*There are certain times of the year when even at the weekend I am having to work and in the evenings I am having to work so you end up a bit stressed and so short of time when you've got work and you've got all the other domestic things to fit in as well then exercise ends up taking the lowest priority and it's very hard to slot it in among everything else particularly when you are then feeling tired and worn out, demotivated*" (Pre, p38).

"*I think that the main thing really is your time constraints*" (Peri, p35)

"*I would probably be more likely to clean up than I would be to do exercise if I had 20 minutes to spare there is a list of on-going stuff that I have to do that would come to my head before that right now*" (Peri, p21)

Some peri-menopausal women believed that as their children get older they would have more time to undertake PA.

"*I had twin boys sort of in my mid-thirties and they're now coming to teenage years so from they were born up until now I haven't had the same time that I used to have*." (Peri, p37)

Post-menopausal women also described how their motivation to undertake MPA was impacted by family and work commitments.

"What would prevent me would be lack of time because I am working full time and I don't have time" (Post, p13)

> "*My lifestyle at the minute would be the biggest for when I was younger I would of done all that you know I would of went swimming as I say it's only in the last couple of yours you know cause I would look after her wee boy after work and all*" (Post, p22)

Others suggested that if they had more time or prioritised PA they would be more likely to achieve recommended levels.

> "*If I had more time*" (Post, p10)

> "*I suppose it's just making the time*" (Peri, p34)

Lack of motivation

It was apparent that pre-, peri- and post-menopausal women lacked the motivation to undertake weekly recommended levels of MPA. When asked what prevented them from undertaking weekly recommended levels of MPA, pre-menopausal women stated:

> "*Honestly, it's being bothered to do it and just getting up and doing it"* (Pre, p28)

> "*You just get stuck in a rut*" (Pre, p6)

These women also expressed concerns about being judged by others, which influenced their motivation.

> "*The fear of people judging you*" (Pre, p19)

> "*If I felt more comfortable, I think I would do more exercise*" (Pre, p17)

Some peri-menopausal women were unsure why they lacked the motivation to undertake recommended levels of MPA.

> "*I definitely lack motivation with regards to physical exercise and I honestly don't know why. I don't know why I lack it at the moment*" (Peri, p33)

While others felt they always had something else to do but acknowledged they were prompted to undertake PA when they learned of others health issues.

> "*Laziness, just lack of interest always finding something you want to do better*" (Peri, p21)

> "*I think sometimes whenever somebody becomes unwell and something happens in their life and the you realise gosh I had better make a few changes here for my own health*" (Peri, p34)

Post-menopausal women also acknowledged motivation as an issue influencing their MPA levels.

> "*Motivation*" (Post, p14)

However, these women felt that they needed to be in the right frame of mind before being motivated to undertake weekly recommended levels of MPA.

> *"You have to talk yourself into it*" (Post, p9)

> "*Nobody else can make you do it or make you want to do it*" (Post, P10)

> "*I think you have to be in the right frame of mind* (Post, p14)

Tiredness

Post-menopausal women believed that they were generally too tired to undertake recommended levels of MPA. However, it was apparent that this finding was linked to family/work commitments and not as a direct result of undertaking the behaviour; this is reflected in the statements below:

> "*You know because you have used up maybe all your energy through that day or over a couple of days*" (Post, p26)

> "*Sometimes I am just too tired to do it if I have a busy day at work*" (Post, p30)

Pre- and peri-menopausal women did not identify believe that tiredness would influence their decision to undertake MPA.

Cost

Pre-menopausal women commonly discussed recreational PA and as such identified cost as a factor that prevents them from undertaking recommended levels of MPA.

> "*It's expensive*" (Pre, p17)

> "*I would say costly as well going by like the gym and activities to be keeping up to that…"* (Pre, p8)

> "*If you go to the gym up there you heyta pay the membership up there*" (Pre, p23)

Cost was not considered as an important issue for peri- and post-menopausal women. However, when placed in context it was evident during the discussions that peri- and post-menopausal women were focused on activities such as walking, which are free.

Seasonal factors

The time of year, weather and dark nights were discussed as factors that prevent pre-, peri- and post-menopausal women from undertaking MPA. Exemplar quotes include:

> *"…cause like weather permitting it's alright in the good weather to get out and walk but you're kind of limited and if you are going to do it in the house you are more than likely not going to bother*" (Pre, p8)

> *Weather can be a factor as well on a really bad day you just sometimes you just don't feel like it*" (Peri, p35)

> *"The weather, I don't know but since I have got older I feel the cold so much now"* (Post, p22)

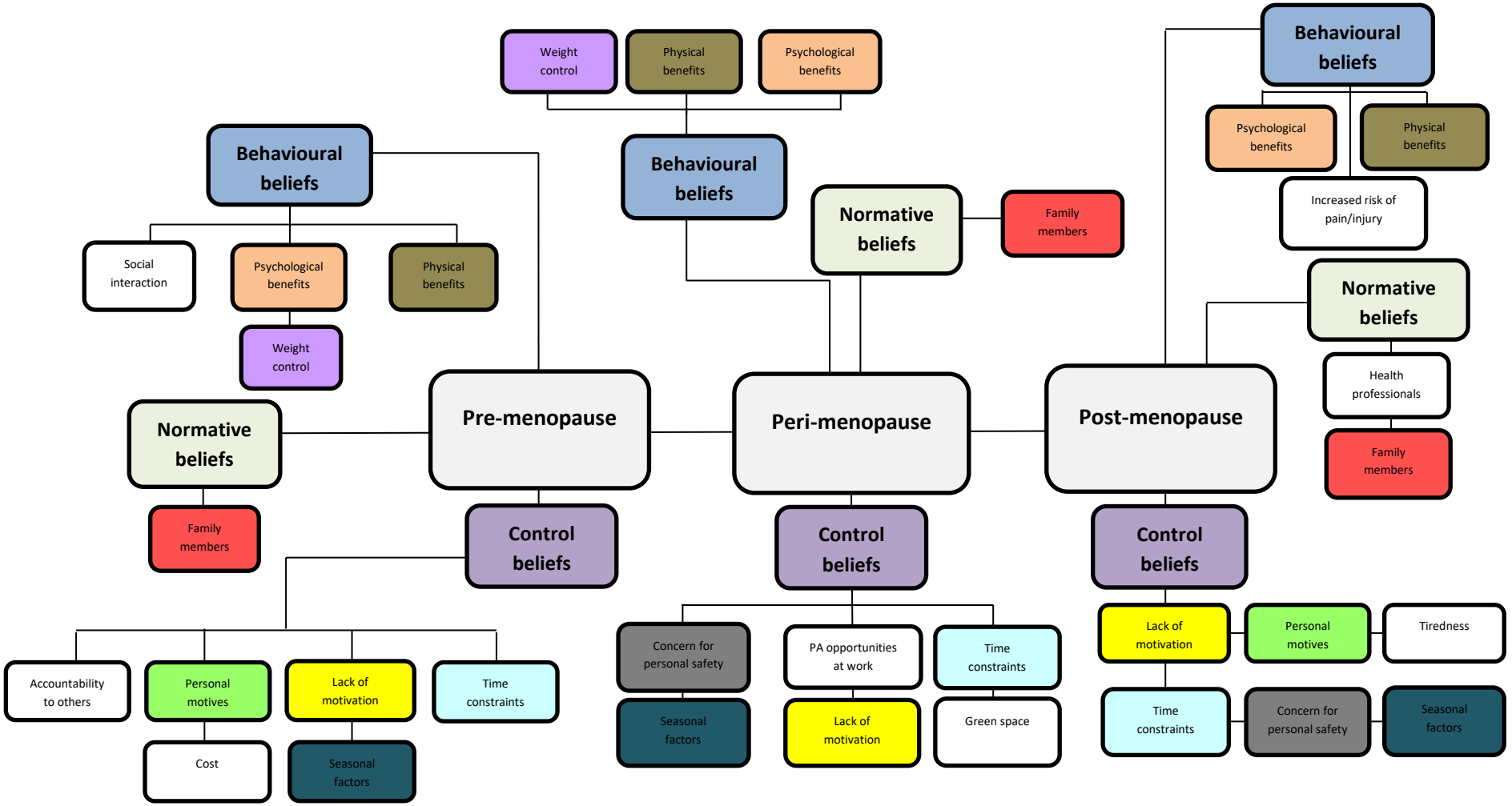
Additional quotes suggests that women are more likely to engaging in PA such as walking when the weather is good.

> "*And the weather because if it's raining you're not going to walk*" (Pre, p1)

> "*I would be a fair weather walker you know on a nice day but not on a regular…*" (Peri, p21)

> "*The weather has to be good*" (Post, p14)

Figure 3.1: Thematic map of the main cognitive processes that contributed to pre-, peri- and post-menopausal women's attitudes and motivation toward undertaking recommended levels of MPA



3.3.3. Women's attitudes and motivations towards performing weekly recommended levels of MSA.

Pre-, peri- and post-menopausal women were unaware of recommended levels of MSA and had limited knowledge of the types of activities that fulfils this recommendation. As a result, it was apparent throughout the discussions that participants had not yet developed clear views or opinions on undertaking this behaviour. Consequently, many women felt they were unable to contribute to the discussion while others were concerned whether their responses were correct. Nevertheless, women's responses towards undertaking recommended levels of MSA are categorised below under three main themes (i.e. behavioural, normative and control beliefs). However, it should be noted that the subthemes within each of these were not well established within the study sample due to the apparent lack of knowledge in relation to this behaviour.

3.3.3.1. Behavioural beliefs

The advantages of undertaking recommended levels of MSA were not well recognised across menopausal groups. Despite this, some women suggested that improved muscular health, psychological benefits and improved body image were advantages of undertaking weekly recommended levels of MSAs but were unable to explain why or discuss their views in more detail. Women more commonly discussed the disadvantages, viewing MSA as unpleasant/boring and likely to result in pain/injury. These views are discussed in turn with exemplar quotes used to provide evidence of the results.

Improved muscular health

Pre, peri- and post-menopausal women who contributed to the discussions suggested that undertaking recommended levels of MSA would improve their muscular health, with women stating:

"*You would feel a bit stronger maybe*" (Pre, p4)

"*Well it is going to be better to feel stronger*" (Peri, p21)

"*It's good to ward off or to help if you've got osteoporosis*" (Post, p10)

Psychological benefits

Pre-, peri- and post-menopausal women recalled psychological benefits as an advantage of undertaking MSA. Exemplar quotes include:

"*Building your confidence and self-esteem*" (Pre, p2)

"*You would probably feel better in yourself*" (Pre, p4)

"*I suppose mental health and everything improves as well*" (Peri, p35)

"*I think you definitely feel a bit more confident*" (Post, p10)

Improves body image

Pre- and post-menopausal women felt that undertaking MSAs would improve their body image with women stating that:

"It's definitely better I think for your shape" (Pre, p15)

"*You would maybe expect to be more toned*" (Pre, p2)

"*I suppose it tones you up more doesn't it*?" (Post, p26)

"*A better looking body, or is that too late*?" (Post, p22)

As mentioned above, these women did not provide any context to support their opinions with further discussion highlighting that women held negative attitudes towards undertaking this behaviour. This point is evidenced by the following quotes:

"*It doesn't burn as many calories and there is not as much benefit to me other than the fact of relaxation I suppose*" (Pre, p8)

"*I don't see any point in doing it when you do other exercises. I don't see why you have to…. I don't think I would benefit from doing strengthening exercises*" (Pre, p6)

"*In my experience I find people who do gym and weights and all once they stop doing that everything just turns to flab and fat so that gives me no motivation to do anything like that*" (Peri, p20)

"*Well as long as it's included in the thing that I like…..but to do something separate…no*" (Peri, p33)

Unenjoyable/Boring

Pre-, peri- and post-menopausal women typically felt that MSA were boring and that they wouldn't enjoy undertaking this behaviour. This finding is reflected by the quotes below:

"*It would be more enjoyable just going for a walk"* (Pre, p1)

"*It bores the life out of me the same with Pilates or yoga or any of them it just bores the complete life out of me*" (Pre, p9)

"*Well it is very boring, would be the top one for me if I was doing it I would be much more likely to go out for a walk or a run if I was capable of that but that to me would be boring you would want to be doing something while you were doing that*" (Peri, p21)

"*I never really liked it to be honest because I found it very boring*" (Peri, p37)

"*The only problem with the muscle strengthening exercise I find is that they tend to be more repetitive and boring than aerobic exercises*" (Post, p10)

To reiterate, this finding was linked to a lack of knowledge. However, in some instances, past experiences of undertaking MSA resulted in a negative attitude towards undertaking this behaviour.

Increased risk of pain/injury

While discussing the disadvantages of undertaking weekly recommended levels of MSAs, pre-, peri- and post-menopausal women mentioned an increased risk of pain/injury. Exemplar quotes include:

"*You could pull a muscle*" (Pre, p4)

"*It would be the pain that would put me off the most*" (Pre, p19)

"*I don't think so because I have done some toms and bums and things like that as well. Exercise to me is too hard it's sore on you*" (Peri p20)

"*Well again I just think if you're doing them you can probably injury yourself*" (Peri p32)

"*The pain afterwards*" (Post, p14)

"*I think you'd be more liable to injury yourself doing muscle strengthening exercises if you didn't do them the right way or if you tried to lift something that was too heavy*" (Post, p10)

Some pre-menopausal women felt that MSA needed to be undertaken at a class facilitated by a trained instructor. Consequently, these women expressed concerns about the level of these classes and their physical capability to perform this behaviour.

"*Sometimes you'll find the fitness class denny really take into consideration the group of people. There's people there a lot fitter than other people and sometimes you can just be pushed you know, to you just think this is not worth going really*" (Pre, p3)

"*You wouldn't be going back because you felt it was too much*" (Pre, p8)

3.3.3.2. Normative beliefs

Health professionals, family members and work colleagues were identified as relevant others that held beliefs about whether participants should undertake MSA.

Health professionals

When asked if there were any groups or individuals who would approve or disapprove of them undertaking MSA, pre- and peri-menopausal women identified health professionals as individuals who would approve of them undertaking this behaviour.

> "*My osteopath*" (Pre, p24)

> "*Doctors*" (Pre, p1)

> "*So I suppose maybe health professionals or allied health professionals would encourage certain things as well*" (Peri, p34)

However, peri-menopausal women went on to discuss how the views of health professionals were unlikely to influence their decision to undertake MSA.

> "*I don't think professionals make the slightest bit of difference in that concern unless you have a really serious illness*" (Peri, p21)

Post-menopausal women that contributed to the discussion did not recall health professionals as individuals who would approve or disapprove of them undertaking MSA.

Family members

A small number of pre- and peri-menopausal women also mentioned family members such as their husband or sisters. However, it was unclear if the views of these individuals would influence their decision to undertake this behaviour.

"*Well yeah my husband would be happy if I was doing it but I don't think his approval makes a lot of difference*" (Pre, p38)

"*My sister probably*" (Peri, p37)

"*It's interesting because my new husband does a lot of exercises for his back because he's had back injuries and he is, uh he's actually been advising me and saying, you should do this and showing me things to do on the floor and stuff*" (Peri, p32)

Work colleagues

Work colleagues were recalled during discussions with pre-menopausal women however, this finding was linked to descriptive norms (i.e. motivated by relevant others behaviour).

"*I would say work colleagues. Sometimes you would follow the trend*" (Pre, p8)

3.3.3.3. Control beliefs

Women more commonly discussed the factors that prevented them from undertaking recommended levels of MSA but considered some factors that would encourage them. Enabling factors included: equipment; receiving support and; getting motivated. While factors that prevented women from undertaking MSA included: time constraints; knowledge; level of motivation; current capability; equipment and; fear of judgement. Exemplar quotes that highlight these findings are presented below.

Equipment

Pre-menopausal women typically associated MSA with exercises that require equipment. As a result, having equipment at home was seen as a factor that would enable these women to undertake this behaviour.

> "*If you had the equipment to do it with at home rather than travelling to the likes of a gym or something*" (pre, p3)

Having equipment at home was not identified as motivational factor among peri- and post-menopausal women.

Knowledge

Pre-, peri- and post-menopausal women felt that they needed more knowledge on MSA. More specifically, these women believed they needed more information on how to undertake these activities at home and in addition to the MPA aspect of the PA recommendations.

> "*The knowledge and understanding of not having somebody that needs to teach you or lead you that you can do it on your own*" (Pre, p2)

> "*I think what would help there would be clear guidelines on exercises that I can do in the house when I've got 5 minutes free and then I could do them several times a week. So something very clear, very specific and that only takes a small amount of time and that doesn't require me to go off somewhere else or you know, get any particular special equipment*". (Pre, p38)

"*The knowledge and understanding of not having somebody that needs to teach you or lead you, that you can do it on your own*". (Pre, p2)

"*Well I don't have a huge amount of knowledge about strengthening exercises I have to say*" (Peri, p21)

"I mean I'm still not 100% sure if I know exactly what is meant by muscle strengthening exercises" (Peri, p32)

"*You don't necessarily know which ones to do*" (Post, p9)

"*A wee bit more instruction maybe would be good*" (Post, p10)

Motivation

Pre- and post-menopausal women felt they need more motivation to undertake recommended levels of MSA. This point is illustrated by the following quotes:

"If I had the motivation to do any of it, I would do it" (Pre, p18)

"Just getting motivated too you know" (Post, p31)

It was apparent that these women were not currently motivated to perform MSA, this was particularly evident among peri-menopausal women.

"*Well I'm just saying personally I, I wouldn't do it*." (Peri, p20)

Fear of being judged

Pre- and peri-menopausal women expressed concerns about being judged by other, suggesting that a fear of being judged by others prevented them from engaging in MSA. This is reflected in the following quotes:

> "*You know if you go to a hall or something and there's people you don't really like you maybe would be inclined not to go back then because you wouldn't want to be exercising in front of them. Another thing is males. Sometimes you don't really like exercising in front of men*" (Pre, p6).

> "*I always think there you know them fitness dvds and things if somebody is standing looking in the window at you, you're like totally affronted*" (Pre, p3)

> "*I suppose maybe people trying to eh undermine you or humiliate*" (Peri, p34)

> "*Well probably nobody is taking the blind bit of notice of you but I just feel really self-conscious*" (Peri, p35)

This finding emerged as women were unsure how to perform these types of activities.

Physical capability

In some instances pre-menopausal women expressed concerns about whether they were fit enough to undertake MSA. This issue did not appear to influence peri- or post-menopausal women's motivation however, it was apparent during the discussions that women were not intending to undertake MSA.

> "*If I was fitter it might not hurt as much*" (Pre, p15)
> "*Being fit enough to do it*" (Pre, p4)

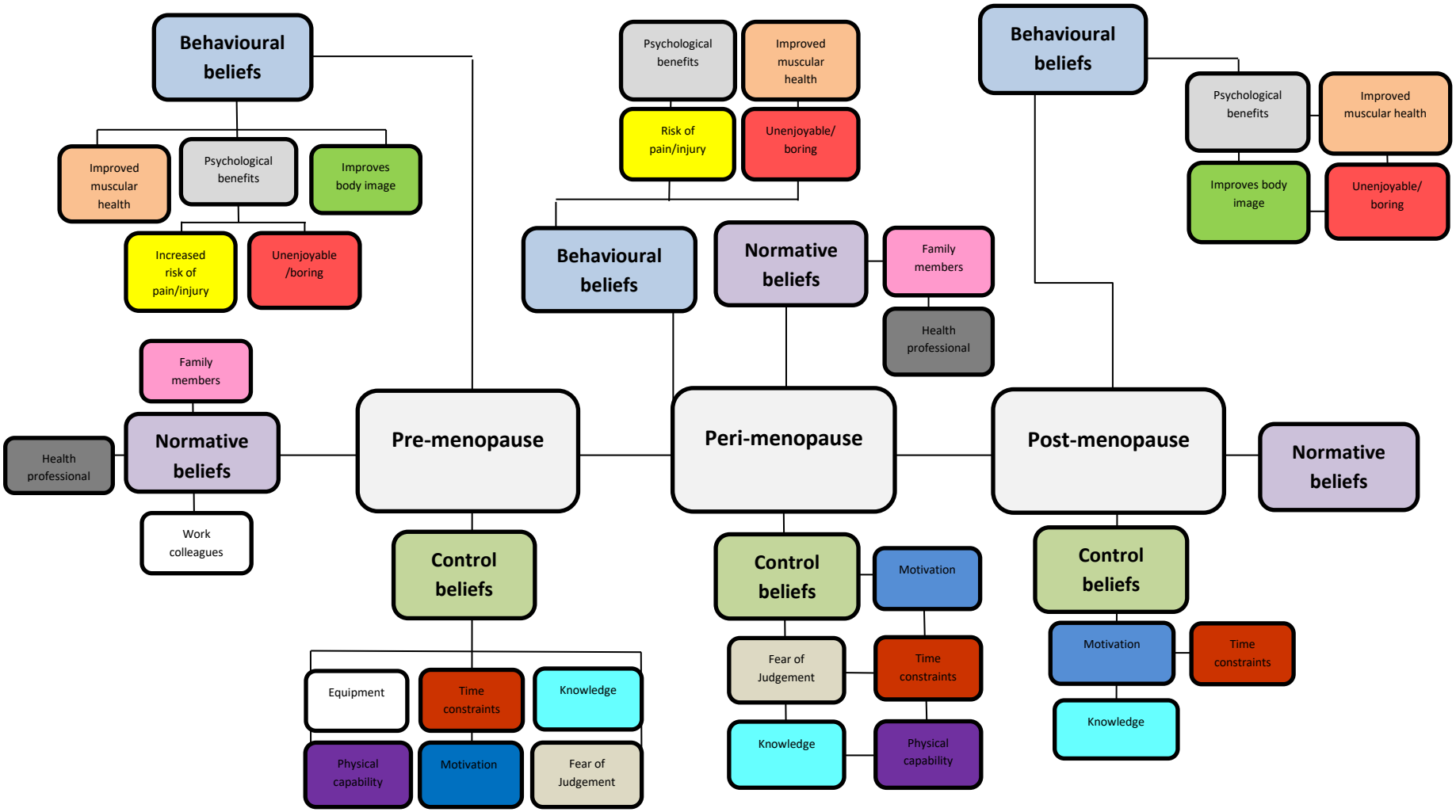
Time constraints

Time constraints were seen as a factor that prevents women from undertaking weekly recommended levels of MSAs, with women stating:

> "*I find time. It's trying to fit it in*" (Pre, p3)
>
> "*Having time*" (Pre, p6)
>
> "It*'s finding the time*" (Peri, p35)
>
> "*It's just family constraints at the moment is really the only thing that would be hindering me and hopefully those in the next year or two will lighten and we'll get back to it* (Peri, p37)
>
> "*It's time*" (Post, p31)
>
> "*Well I don't do any for the simple fact two days of the week I am on my feet 13 hours a day. I think that's long enough*" (Post, p30)

Despite acknowledging time constraints as a barrier, women did not consider ways to overcome this issue.

Figure 3.2: Thematic map of the main cognitive processes that contributed to women's attitudes and motivation toward undertaking recommended levels of MSA based on menopausal status



3.4. Discussion

To my knowledge this was the first study to explore the cognitive processes that underpins pre-, peri- and post-menopausal women's attitudes and motivations towards performing recommended levels of MPA and MSA using the TPB. The present study found that these women held positive attitudes towards undertaking MPA but negative attitudes towards performing MSA. Consistent (e.g. physical & psychological benefits) and distinct (e.g. social interaction; PA opportunities at work & accountability to others) issues were found to influence women's attitudes and motivations towards undertaking MPA across menopausal phases. Knowledge of recommended levels and how to perform MSA was the main issue that influenced women's attitudes and motivation towards undertaking this behaviour, regardless of menopausal status.

PA recommendations were updated in 2011 to provide more flexibility in the way recommended levels of PA are achieved and to include MSA (DoH, 2011). Despite this, the results from the present study suggested that women's awareness of current recommended levels of MPA was low. Although past and present recommendations equate to the same amount of PA, this finding has significant implications for public health. The recommendations were amended with a view to increasing the number of people achieving these thus, if people are unaware of this change, it is unlikely to influence behaviour. Despite this, when responding to the questions related to MPA, participants were able to relate their views and opinions to their knowledge of previous PA recommendations which have been disseminated for many years (i.e. 30 minutes of PA, 5 times a week).

Consequently, pre-, peri- and post-menopausal women's awareness of current recommended levels of MPA did not prevent these women from discussing the factors

that influence their attitudes and motivations to performing this level of PA. In contrast, this finding had considerable implications for women's knowledge and understanding of MSA. It was apparent that women were unaware of recommended levels of MSA and the types of activities that constitute MSA. Thus, women found it difficult to share their views and opinions on an unfamiliar topic. Consequently, the subthemes considered as pre, peri- and post-menopausal women's behavioural, normative and control beliefs towards undertaking MSA were not well established within the study sample. In light of this, the results may be influenced by social bias as opposed to their personal opinions. Previous research consistently identifies knowledge as a key factor that in the decision making process of health behaviours (Devoy & Simpson, 2016; Gholamnia, Shirvani, Ghofranipour, Gharakhanlou & Kazemnejad, 2015). Given this, the findings from this research suggest that initiatives are required to promote both aspects of the PA recommendation. However, these initiatives should place considerable emphasis on increasing women's knowledge of MSA. Consequently, it is recommended that a TPB-based intervention to promote pre-, peri- and peri-menopausal women's participation in recommended levels of MPA and MSA begins by increasing knowledge of these behaviours.

Despite this, the current study provides some insight on the cognitive processes that underlie pre-, peri- and post-menopausal women's attitudes and motivations towards undertaking MPA and MSA. However in relation to MSA, the results should be considered with the limitations in mind. With regards to MPA, the current study reported a series of behavioural beliefs that were in agreement with previous research (Downs & Hausenblas, 2005; Belanger-Gravel et al. 2012; Hamilton & White, 2010; Nazaruk et al. 2016; O'Dougherty et al. 2008). These included: psychological and physical health benefits; weight control; social involvement and an increased risk of

pain/injury. However, the importance of these beliefs differed across menopausal groups. For example, this research suggests that pre- and peri-menopausal women considered the psychological benefits of undertaking MPA more important than the physical health benefits. Reproductive ageing may have played a role in this finding as pre-menopausal women discussed the need to elicit the psychological benefits of PA due to daily stresses associated with parenthood. In addition, peri-menopausal women focused on the psychological benefits of MPA and continually expressed the need to clear their head and de-stress. Although peri-menopausal women did not explicitly state why these benefits were important, it is possible that the psychological consequences of the menopausal transition may have indirectly influenced this finding (Bromberger et al. 2011; Simpson and Thompson, 2016). However, further research exploring the link between undertaking MPA and the menopausal transition is required to determine if these issues are linked. Nonetheless, interventions that aim to increase pre- and peri-menopausal women's participation in MPA should consider promoting the psychological benefits specific to these women.

Furthermore, it is possible that reproductive ageing also resulted in weight control emerging as an important motivational factor among pre- and peri-menopausal women. Research conducted by Umberson, Mirowsky and Reczek (2011) suggested that parenthood contributes to long term weight gain and recognises that life course factors may accelerate this process. In addition, it is well accepted that women experience a reduction in energy expenditure as a result of the menopause (Lovejoy, 2009). However, this finding has significant implications for interventions aimed at promoting MPA in these women as undertaking this level of PA is unlikely to result in weight loss (DoH, 2011). Thus, it is imperative that such an intervention addresses this inaccuracy.

Pre-, peri- and post-menopausal women considered the physical health benefits as an advantage of undertaking recommended levels of MPA. However, the current findings suggest that these benefits may not be a strong motivator for pre- and peri-menopausal women. The finding suggest that promoting the physical health benefits of undertaking MPA may have more effect on post-menopausal women's level of MPA than their younger counterparts. From a public health perspective it is encouraging that physical health benefits are important among ageing women as risk of NCD (e.g. musculoskeletal conditions; CVD; cancers) increase following the menopause (Karageorgi, et al. 2010; Van Dijk et al. 2015; Woodard et al. 2011).

In the current study, social interaction was found to influence pre-menopausal women's motivation to undertake MPA. Although it was apparent that these women viewed the social side of PA as an advantage, this factor was associated with pre-menopausal women's control beliefs. More specifically, undertaking PA with others increased an individual's commitment to fulfil their PA intentions. Thus, suggesting a social support element incorporated within an intervention could motivate pre-menopausal women to undertake this behaviour. This finding is similar to other PA studies using the TPB (Hamilton, & White, 2010). In contrast, peri-menopausal women preferred to do PA alone. This finding was linked to the psychological benefits associated with undertaking MPA. Given that the menopause is commonly associated with psychological distress (Simpson & Thompson, 2016), this finding may reflect the transitional effects of the menopause on well-being. Social interaction was not viewed as an advantage of undertaking MPA in post-menopausal women. In relation to the disadvantages of undertaking recommended levels of MPA, an increased risk of pain/injury was the only negative outcome reported. However, whether this would

influence their decision to undertake MPA unless they had a predisposed health condition is unclear.

In relation to normative beliefs, family members were identified as sources of perceived social pressure across groups while health professionals were specific to peri- and post-menopausal groups. Consistent with previous research (Belanger-Gravel et al. 2012; Blue, Marrero, & Black, 2008; Downs & Hausenblas, 2005), approval was not essential when deciding to undertake weekly recommended levels of MPA. It emerged that family member's PA behaviour and encouragement may be more influential when deciding to undertake MPA. This finding is consistent with the descriptive norm component of the TPB (Rivis & Sheeran, 2003) and previous research has identified observing behaviour as a motivational factor in PA participation (Gray, Murphy, Gallagher & Simpson, 2016). Thus, the findings suggest that including family members within an intervention for pre-, peri- and post-menopausal women may be useful when promoting MPA. Post-menopausal women mentioned that health professional would approve of their decision to undertake MPA, suggesting that social pressure from individuals such as doctors may motivate these women to participate in MPA. Although it was apparent that personal motives are important when deciding to undertake MPA. Given this, the results suggest that personalised information from health professionals tailored to the individuals health needs may motivate post-menopausal women to participate in recommended levels of MPA.

The factors that would enable or prevent pre-, peri- and post-menopausal women from undertaking recommended levels of MPA (e.g. time constraints, lack of motivation; health issues; the weather; establishing a routine) were similar to previous research (Blue et al. 2008; Downs & Hausenblas, 2005; Hamilton, &White, 2010; Vallance,

Murray, Johnson, & Elavsky, 2011). However, additional issues included personal motives, accountability, PA opportunities at work, green space and concerns for personal safety. Constraints on time were identified as the main barrier to undertaking MPA. This finding was consistent across menopausal groups but was particularly influential in whether peri-menopausal women would consider undertaking MPA. It was apparent that undertaking MPA was not a priority for these women due to work commitments and parental responsibilities (e.g. school runs; after school activities; youth clubs). Therefore, to promote positive attitudes and motivate women across the life course, there is a need to address perceived time constraints and develop time management skills. Given the emphasis placed on time constraints among peri-menopausal women, intervention designers should consider ways to reduce the time commitment that would be required for these women to participate in an intervention to increase MPA. Thus, this finding has implications for the duration and mode of delivery of an intervention given that women may not enrol in the intervention if they consider it too time consuming.

There is an apparent dearth of theoretical approaches to exploring the issues influencing women's attitudes and motivations towards undertaking MSA thus, making it difficult to place the current findings in the context of previous research. However, given that knowledge is consistently linked with intention to perform health behaviours (Devoy & Simpson, 2016; Giles et al. 2010), an intervention for the target populations should aim to improve their knowledge of this behaviour, the associated benefits and how to complete these activities in line with recommendations and in addition to MPA. Furthermore, large scale media campaigns may be needed to disseminate this information to a larger cohort of women. However, further research is required to fully understand the proportion of women meeting recommended levels

of MSA. Nevertheless, in the context of this thesis, increasing women's knowledge of MSA within the intervention will help establish clear views and opinions towards undertaking MSA at key transitional phases.

In addition, increasing women's knowledge of home-based activities could minimise control factors such as concerns relating to physical capability, fear of being judged and time constraints. However, previous research suggests that this approach may have limited impact if environmental factors are not promoted at the same time (Cleland, Ball, Salmon, Timperio & Crawford 2008). This can be addressed by informing women of opportunities to undertake MSA within their local environments in addition to home-based MSA. Given that negative perceptions towards undertaking MSA were identified, future interventions should incorporate intervention components that aim to promote more positive views towards this behaviour. This may be achieved indirectly by increasing their knowledge on this topic. However, providing women with facilitated experiences that allows them to model these behaviours could also help address this issue.

It emerged that the behaviour of relevant others such as immediate family members and work colleagues influenced women's participation in MSA. Thus, in line with MPA, the findings suggest that the behaviour of significant others, referred to as descriptive norms within the TPB, may influence levels of MSA in women. Although the issues discussed were not well established they do suggest that barriers such as time constraints, motivation, fear of being judged and physical capabilities influence pre-, peri- and post-menopausal women's attitudes and motivation towards undertaking MSA. The control factors reported in this research are in line with previous research that has identified the determinants of MSA in women (O'Dougherty

et al. 2008; Nazaruk et al. 2016). However, it is notable that more barriers than enabling factors were recalled, suggesting that an intervention for these populations will need to minimise these barriers and incorporate numerous intervention components that aim to promote more positive attitudes towards this behaviour.

3.4.1. Limitations

There are a number of limitations that should be recognised when interpreting the findings from this research. The main limitation was the approach adopted to determine menopausal status. Self-reported menopausal status is not always accurate, although characteristics of menses and age are commonly used in previous research to determine menopausal status (Brandon, Minhajuddin, Thase & Jarrett, 2013). In addition, the results are representative of a subsample of women in NI and therefore may not be generalizable. However, the methods used are in line with guidance provided by Ajzen (2011) when using the TPB to inform the design of interventions. As mentioned above, participants perspectives on MSA were not well established which may have resulted in respondents providing socially acceptable responses that are not indicative of the issues underlying their decision to participate in MSA. Given that women did not have a clear understanding of MSA, the findings from this aspect of the study should be considered with caution. Despite this, the research included in this chapter has identified an important issue for public health.

3.4.2. Conclusions

This phase of the research process set out to understand the cognitive processes that underpin pre-, peri- and post-menopausal women's attitudes and motivations towards undertaking recommended levels of MPA and MSA. Given that the TPB was drawn upon as theoretical model this information was presented in the context of behavioural, normative and control beliefs. Given that the differences across groups was evident in relation to MPA, the results of this study suggested an intervention to promote pre-, peri- and post-menopausal women's participation in the weekly recommended level of MPA should be tailored to reflect the consistent and distinct beliefs identified in the present study. Although consistent and distinct beliefs underlying pre-, peri- and post-menopausal women's decision to perform MPA was found across groups, peri-menopausal women have specific needs that relates to their views about undertaking MPA alone, time, priorities and general sense of self during this phase. Consequently, this initial investigation suggested that promoting MPA in peri-menopausal women may be more complex than their pre- and post-menopausal counterpart.

In contrast, the current study found that pre-, peri- and post-menopausal women held negative attitudes towards undertaking MSA. Furthermore, behavioural, normative and control beliefs that could potentially motivate these women to undertake MSA were not well established due to an apparent lack of knowledge on this topic. Thus in conclusion, an intervention to increase MSA in these populations should primarily focus on increasing knowledge and establishing positive attitudes.

In keeping with the theoretical approach used to guide this work, there is a need to further identify and explain the factors that influence pre-, peri- and post-menopausal women's decision to undertake MPA and MSA before designing an intervention for

these women. To inform the second phase in the research process (i.e. questionnaire-based study), subthemes/codes identified in this study were higher ranked within their respective theoretical theme. The top 70% of these were then considered for inclusion in a TPB-based questionnaire. Further information on phase two of the research process is presented and discussed in the next chapter (i.e. Chapter four).

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Chapter Four

Identifying and explaining the factors that influence pre-, peri- and post-menopausal women's intention to undertake minimum recommended levels of physical activity using the Theory of Planned Behaviour

4.0. Abstract

Background: In line with the guidance provided by Ajzen for developing an intervention using the Theory of Planned Behaviour, the aim of this research was to assess underlying beliefs and the relative importance of the Theory of Planned Behaviour components on intention to undertake recommended levels of moderate physical activity and muscle strengthening activities.

M*ethods*: This study employed quantitative methodology and used a Theory of Planned Behaviour-based questionnaire to collect information on participant demographics; levels of moderate physical activity and muscle strengthening activities; affective and instrumental attitudes; descriptive and injunctive norms; self-efficacy and controllability and; beliefs underlying the decision to undertake moderate physical activity. In total, 186 women completed the questionnaire. Descriptive statistics, bivariate correlations, analysis of variance and regression analyses were used to analyse the data.

Results: Beliefs underlying pre-, peri- and post-menopausal women's intention to undertake moderate physical activity differed slightly across groups. Self-efficacy ($\beta = .578$, $p<.001$), affective attitudes ($\beta = .168$, $p<.007$) and descriptive norms ($\beta = .126$, $p<.027$) significantly predicted intention to undertake this behaviour, independent of menopausal status. With regards to muscle strengthening activities, self-efficacy ($\beta = .382$, $p<.001$) and affective attitudes ($\beta = .279$, $p<.001$) significantly predicted intention, independent of menopausal status.

Conclusions: An intervention aimed at increasing pre-, peri- and post-menopausal women's levels of moderate physical activity should be tailored to reflect group differences in beliefs underlying their intention to undertake this behaviour. In addition, the current study indicated that an intervention should include strategies to increase women's sense of self-efficacy, affective attitudes, descriptive norm towards undertaking moderate physical activity with additional strategies to increase self-efficacy and affective attitudes towards undertaking muscle strengthening activities, irrespective of menopausal status.

4.1. Introduction

As mentioned previously, developing an intervention using the Theory of Planned Behaviour (TPB) requires three sequential research phases. The first research phase was presented in Chapter three and outlined the main beliefs found to influence pre-, peri- and post-menopausal women's decision to perform recommended levels of moderate physical activity (MPA) and muscle strengthening activities (MSA). The findings from phase one provided initial information on the needs of the target populations and as such will directly influence the intervention design. However, in keeping with the operationalisation of the TPB, the second research phase requires researchers to further explore the main findings reported in phase one and directly measure the components of the TPB using quantitative methodology.

In the present Chapter, the second research phase is described. The aim of this research was to identify and explain the TPB components that predict women's intention to undertake MPA and MSA, in a subsample of the target populations. Obtaining this information provides an in-depth understanding of the factors that influence people's intention to perform specific behaviours. In turn, an intervention can then be directed at one or more of these determinants with the aim of promoting positive deliberation and/or behavioural strategies that aid implementation of intentions (Ajzen, 2011).

Given the popularity of the TPB within health related research (Benson et al. 2015; Cook & French, 2008; Giles et al. 2010), it is not surprising that the TPB has been used extensively to identify the factors influencing PA in diverse populations (for example: Boudreau & Godin, 2009; Downs & Hausenblas, 2005; Omondi, Walingo, Mbagaya & Othuon, 2010; Plotnikoff et al. 2013; Newham, Allan, Leahy-Warren, Carrick-Sen & Alderdice, 2016; Shirvani et al. 2014; Vallance et al. 2011). However,

to date few such studies have subsequently designed and evaluated an intervention based on this information. Despite this, previous research provides insight on the utility of the TPB and the factors that influence intentions in diverse populations.

For example, Downs and Hausenblas (2005) published a meta-analysis of PA studies using the TPB. The findings support the predictive ability of the theoretical framework with the results indicating that the TPB components account for approximately 40% of the variance in intentions to exercise. The results identified attitudes and PBC as the strongest predictors of intention while subjective norm was the weakest predictor of intention. This is in line with the majority of TPB research although, some studies have found subjective norm to predict PA intentions (Omondi et al. 2010; Shirvani et al. 2014), although cultural differences in family structures may account for this finding.

Research has continued to draw on the TPB as a theoretical framework. In 2009, Boudreau and Godin investigated the factors that influence adult's with type 2 diabetes intention to participate in leisure time PA. In line with the findings from Downs and Hausenblas (2005) attitude and PBC were found to predict intention to perform this behaviour. More recently, Vallance et al. (2011) explored the factors that influence post-menopausal women's intention and behaviour using a two component model of TPB (i.e. affective and instrumental attitudes; injunctive and descriptive norms; self-efficacy and controllability). This model of the TPB explained 44% of the variance in intention to undertake MPA. However, instrumental attitude, affective attitude, descriptive norm and self-efficacy were the only components that made a significant contributed to intentions. The study also considered the beliefs underlying post-menopausal women's decision to perform MPA (e.g. identifying weight loss;

musculoskeletal problems; improved physical and mental well-being). Doctors, husband/spouse and children were frequently reported as normative referents. Companionship, planned and scheduled PA, too busy and the weather were common control beliefs.

A study by Aparicio-Ting, Farris, Courneya, Schiller and Friedenreich (2015) was conducted using the TPB to explore the factors that influence post-menopausal women's recreational PA behaviour, following a 12-month intervention. The study comprised of 320 women who were randomised to either a control or intervention group. Following the intervention, a TPB questionnaire was administered. The result showed that self-efficacy and behavioural beliefs were predictive of long-term recreational PA. Thus, suggesting that interventions should promote self-efficacy and positive behavioural beliefs in this population. The TPB has also been used to explain PA intentions in overweight/ obese adolescents and Iranian military wives (Plotnikoff, et al. 2013; Shirvani, et al. 2014). In line with previous research, the findings identified attitudes and PBC as predictors of adolescent intentions to undertake PA whilst, subjective norm and PBC were identified as predictors of intention among Iranian military wives.

The research outlined above relates to aerobic PA, with research to date primarily focused on this aspect of the PA recommendations. Despite the recognised health benefits associated with undertaking MSA (Cullinen & Caldwell, 1998), commonly referred to within the literature as strength training or resistance training activities, only a limited number of studies have explored the utility of the TPB and the factors that influence intention to perform MSA (Bryan & Rocheleau, 2002; Dean, Farrell, Kelley, Taylor & Rhodes, 2007; Plotnikoff, Courneya, Trinh, Karunamun & Sigal,

2008). For example, Bryan and Rocheleau (2002) found that the TPB predicted 19% of the variance in intention to perform aerobic PA and 40% of the variance in intentions to perform resistance exercises. Dean et al. (2007) used the TPB to gain an understanding of the factors that influence older adult's (i.e. males and females >55 years) intention to perform strength training activities and observed that subjective norm and PBC explained 42% of the variance in intention, suggesting that interventions targeting these components may help promote participation in strength training activities in older adults. In contrast, Plotnikoff et al. (2010) found that attitudes and descriptive norms were significantly associated with intention to perform resistance training in adults with type 2 diabetes, explaining 45% of the variance in resistance training intention. However, the study found no association between intention and behaviour or the TPB variables and behaviour.

While previous research supports the utility of the TPB and increases our understanding of intention formations for aerobic PA (including MPA) and MSA in diverse populations, research has yet to use the TPB to understand the factors that influence these behaviours in a life course study of pre-, peri- and post-menopausal women in NI. According to Ajzen (2011) identifying and explaining the relative importance of the TPB components that predicts intention is a fundamental process in designing an intervention using the TPB. Thus, it is imperative that the factors that influence pre-, peri- and post-menopausal women's' intentions to undertake recommended levels of MPA and MSA are understood in the context of the TPB before proceeding to the intervention design.

4.1.1. Aim

The aim of the research presented in this Chapter was to identify and explain the significant predictors of pre-, peri- and post-menopausal women's intentions to undertake minimum recommended levels of MPA and MSA, using the two component model of TPB. This research was undertaken with a view to informing the design of a TPB-based intervention for these women.

4.2. Methodology

This study used quantitative methodology involving a TPB-based questionnaire to identify and explain the significant predictors of pre-, peri- and post-menopausal women's intentions to undertake minimum recommended levels of PA, specifically at least 150 minutes of MPA and MSA on at least two days, each week.

4.2.1. Participants

Purposeful sampling techniques (Patton, 2002) were used to recruit 186 women aged 30-64 years from Ulster University (Belfast, Coleraine, Magee, Jordanstown) and community organisations in Northern Ireland (NI). Staff and students at Ulster University were invited to complete an online questionnaire via email. The email contained information on what would be involved by participating and inclusion/exclusion criteria. A link to the information sheet, consent form and questionnaire was included on the invitation. Similarly, women recruited to this study from community organisations were provided with information on the purpose of this

research, n the inclusion/exclusion criteria and what would be involved by participation. This information was delivered in person by the researcher. Individuals willing to partake were then asked to provide consent and complete a TPB-based questionnaire.

In order to determine menopausal status, characteristics of menses and age were used. Inclusion criteria were as follows: women aged 30-64 years; women <48 years of age reporting regular menses were included as pre-menopausal; women >40 years of age but less than 55 years reporting irregular menses were included as peri-menopausal; and women reporting cessation of menses for >12 months due to the menopause were included as post-menopausal. Menopausal status for participants reporting a hysterectomy or use of contraception was determined based on the following criteria: pre-menopausal, <48 years; peri-menopausal >48 years but <55 years of age; and post-menopausal >55 years. Exclusion criteria were as follows: self-reported bilateral salpingo-oophorectomy (i.e. hysterectomy and removal of both ovaries).

4.2.2. Measures and materials

A TPB-based questionnaire was designed to collect information on participant characteristics (i.e. age, marital status, health and wellbeing, menopausal status, BMI and highest level of education), the TPB components (i.e. affective and instrumental attitudes; injunctive and descriptive norms; controllability and self-efficacy), belief based measures for MPA and levels of PA and MSA. As such, the questionnaire contained four sections, the items included in each section are described below (a copy of the questionnaire is available in Appendix 2).

Section one: demographic information

Section one included twelve items (i.e. age, level of education, height, weight, marital status, relationship status; number of children, regularity of menses; length of time since previous menses and reasons for cessation). Questions included: "Please state your age in years", "height", "weight", "please indicated your highest level of education" (i.e. primary, secondary, college or university level), "please indicate your relationship status" (i.e. married, in a relationship, single, windowed or divorced), "how long has it been since your last period" (i.e. 1-3 weeks, 1.-6 months, 7-12 months, 1-3 years or 3-5 years), "would you describe your period as" (i.e. regular, more irregular than normal, have always been irregular or have stopped all together) and " If your periods have stopped what are the reason" (i.e. hysterectomy, menopause, thyroid, diabetes, contraception, pregnancy or other).

Section two: health and wellbeing

The standard (4-week recall) Short Form -12 health survey version 2 (SF-12v2) was used to measure health and wellbeing in section two of the questionnaire. This survey included seven items measuring eight domains: (1) physical functioning, (2) role-physical with physical health problems, (3) bodily pain, (4) general health, (5) vitality, (6) social functioning, (7) role-participation with emotional health problems and (8) mental health. A physical component summary (PCS) score was computed by adding participant scores for items one to four. Similarly, a mental component summary (MCS) score was calculated for items five to eight. The SF-12 Health Survey was scored using the QualityMetric Health Outcomes Scoring Software (Ware et al. 2009) with higher scores indicating better physical and mental health. Average summary scores for PSC and MCS were used to present the data (i.e. the percentage per group

scoring above or below 50). The SF-12 has been widely validated and is considered as a reliable assessment method (Cheak-Zamora, Wyrwich, & McBride, 2009).

Section three: quantitative assessment of TPB variables

Section three of the questionnaire assessed respondents' affective and instrumental attitudes, injunctive and descriptive norms, controllability and self-efficacy, and behaviour specific intentions for both MPA and MSA using three items per component (see Tables 4.1 & 4.2 for questionnaire items by mode of PA). All questions were scored using a 7-point Likert scale and mean scores computed for each component. Higher scores reflected more favourable attitudes (i.e. affective and instrumental), higher levels of social pressure/descriptive behaviours by significant others and higher levels of controllability and self-efficacy. The internal consistency (α) of the TPB components (Tables 4.1 & 4.2) are similar to other TPB studies (Courneya, Conner & Rhodes, 2006; Vallance et al. 2011).

In keeping with the procedures outlined by Francis et al (2004) and Fishbein and Ajzen (2010) for constructing a TPB-based questionnaire, belief based measures were designed to reflect the main findings identified in Chapter three of this thesis. However, it should be noted that belief based measures were not developed for MSA given that the results presented in Chapter three found that these beliefs were not well established.

In relation to MPA, 28 items were devised to measure the main behavioural, normative and control beliefs identified in phase one of this research process: (1) behavioural beliefs included: 'feeling less stressed'; 'feeling better'; 'improves mood', 'clears your head'; 'improves health'; 'promotes weight loss'; 'promotes social interaction';

'enjoyment'; 'promotes children's health'; 'tiredness' and 'pain'; (2) normative beliefs included: family members; partner/spouse and; doctors; (3) control beliefs include: expense; time constraints; work commitments; family commitments; the weather; concern for personal safety; opportunities at work; having a reason/purpose; personalised goals and; company. Behavioural and normative beliefs were measured using a 7-point Likert scale ranging from 1 = extremely unlikely to 7 = extremely likely while control beliefs were measured using a 7-point Likert scale ranging from 1 = extremely false to 7 extremely true.

Corresponding expectancy items were developed and assessed, again using 7-point Likert scales. Responses for outcome evaluations ranging from -3 = extremely bad to +3 extremely good, motivations to comply with normative expectations which ranged from -3 = extremely disagree to +3 = extremely agree and power of control ranged from -3 = less likely to +3 = more likely. Behavioural, normative and control beliefs were multiplied by their respective expectancy items to create an expectancy-formulated score for each belief based measure.

Section four: Physical activity levels

The IPAQ-SF (IPAQ-SF, 2003) was utilised to measure PA levels in section 4 of the questionnaire. Participants were asked to report on how many days during the past seven they engaged in vigorous, moderate or walking activities for more than 10 minutes at a time. A further three items assessed the duration of these activities. The final question asked respondents to recall how long they spent sitting on one weekday in the past seven days. Responses were scored according to the IPAQ -SF scoring protocol and categorised as one of the following, inactive, minimally active or highly active (IPAQ, 2005). In line with previous research the highly active classification

was selected to categorise responses as meeting the at least 150 minutes of MPA (Bauman et al. 2009). The IPAQ- SF has been used in previous research comprising of menopausal women (Kim, Cho, Ahn, Yim & Park, 2014) and demonstrates adequate levels of reliability and validity (Craig et al. 2003). Since the IPAQ-SF does not explicitly measure MSA, a further two items were included to measure this behaviour (i.e. "during the last 7 days, on how many days did you do strengthening activities like sit ups, push ups or working with weights" and "what area of the body did you work?"). Participants who reported undertaking MSA that worked the core muscle groups (i.e. legs; arms; back; hips; chest; abdomen and; shoulders) on at least two days in last 7 days were considered as meeting current recommended levels.

Table 4.1

Questionnaire items, scales and Cronbach's α reliabilities of the TPB components relating to MPA

TPB construct	n	Questionnaire items	α
Intention	3	I intend/will try/have decided to do 150 minutes of MPA each week: likely/unlikely	.952
Instrumental attitude	3	I think that doing 150 minutes of MPA each week would be: good/bad, harmful/beneficial, useless/useful	.689
Affective attitude	3	I think that doing 150 minutes of MPA each week would be: unpleasant/pleasant, boring/not at all boring, Unenjoyable/enjoyable.	.877
Subjective norm	3	I think that most people who are important to me would support/encourage/approve of me doing 150 MPA each week: agree/disagree	.867
Descriptive norm	3	Most of my friends/work colleagues/family will do 150 minutes of MPA each week: agree/disagree	.856
Self-efficacy	3	I am confident/capable of doing 150 minutes of MPA each week; I believe I could do 150 of MPA each week: agree/disagree	.882
Controllability	3	I have complete control over whether or not I do 150 MPA each week: The decision to do 150 minutes of MPA each week is beyond my control: whether or not I do 150 MPA each week is up to me: agree/disagree	.727

Note. All items were developed based on the target, action and time elements of the TACT principle outlined by Francis et al. (2004) for constructing TPB-based questions. The action element was enhanced as a context for performing recommended levels of MPA was not included within the operational definition of this behaviour. Abbreviations are as follows: MPA = moderate physical activity.

Table 4.2

Questionnaire items and Cronbach's α reliabilities of the assessment measures for each construct relating to MSA

TPB construct	n	Questionnaire items	α
Intention	3	I intend/will try/have decided to do activities to improve MS on at least two days each week: likely/unlikely	.959
Instrumental attitude	3	I think that doing activities to improve MS on at least two days each week would be: good/bad, harmful/beneficial, useless/useful	.883
Affective attitude	3	I think that doing activities to improve MS at least two days each week would be: pleasant/unpleasant, boring/not at all boring, enjoyable/unenjoyable	.917
Subjective norm	3	I think that most people who are important to me would support/encourage/approve of me doing activities to improve MS on at least two days each week: agree/disagree	.867
Descriptive norm	3	Most of my friends/work colleagues/family will do activities to improve MS on at least two days each week: agree/disagree	.855
Controllability	3	The decision to do activities to improve MS on at least two days each week is beyond my control, I have complete control over whether or not strengthening activities on at least two days each week, whether or not I do activities to improve MS on at least two days each week is up to me: agree/disagree	.756
Self-efficacy	3	I am confident/capable/ of doing activities to improve MS on at least two days each week, I believe I could do strengthening activities on at least two days each week: agree/disagree	.929

Note. All items were developed based on the target, action and time elements of the TACT principle (target, action, context & time) used to construct TPB-based questions (Francis et al. 2004). The action element was enhanced as a context for performing weekly recommended levels of MSA was not included within the operational definition of the behaviour. Abbreviations: MS = Muscle Strength.

4.2.3. Procedure

A TPB-based questionnaire was developed and piloted with five individuals to assess the acceptability of the questionnaire items. These individuals were asked the following questions: "are any items ambiguous or difficult to understand"; "does the questionnaire feel too repetitive"; "does it feel too long"; does it feel too superficial"; "are there any annoying features of the wording or formatting". Reponses were also reviewed by the researcher to determine whether endpoints resulted in inconsistent responses. From this, it was suggested that the response format used to measure injunctive/descriptive norm items made the questions difficult to understand. Consequently, the response format used to assess these constructs were amended before administering the questionnaire to a larger target population. A copy of the final study questionnaire is available in Appendix 2.

In order to aid recruitment, the questionnaire was available for participants to complete in two formats (i.e. an electronic version using Qualtrics and a paper-based version). Recruitment took place at Ulster University and also at local community groups. An email containing the link to the online questionnaire was circulated at Ulster University while women recruited at local community groups either completed the questionnaire using the Qualtrics app or a paper version. This process appeared to work well and presented fewer challenges than those experienced in the first phase of this research. It is possible that women were more willing to contribute to a questionnaire-based study than research involving focus group/interview.

4.2.4. Data analyses

Data were analysed using SPSS v 22. Checks for missing data, normal distribution, outliers, multicollinearity and homogeneity of variance were conducted (Collican, 2009; Kline, 2010; Tabachnick & Fiddel, 2007). Descriptive statistics, Pearson's bivariate correlational analysis, hierarchical multiple regression analyses, analysis of variance (ANOVA) and logistic regression analyses were computed to explore the data. BMI was calculated in accordance with guidance provided by the WHO (2015): as such, self-reported weight (kg) was divided by height^2 (m^2), the following classifications were accepted as; normal range 18.5 – 24.99 kg/m^2, over weight 25 – 29.99 kg/m^2 or obese >30 kg/m^2.

4.2.5. Ethical considerations

Ethical approval was obtained from Ulster University, School of Psychology Post-graduate and Staff Research Filter committee. Following this, approval to recruit participants at Ulster University (via email) and local community groups (in person) was sought from relevant individuals (i.e. the research director/the faculty dean; group leaders).

Recruitment commenced once approval from Ulster University/community organisations was obtained. All participants were provided with an information sheet to ensure they were fully informed about the study and consent was obtained prior to completing the questionnaire. Individuals filing in the paper version of the questionnaire were asked to return the consent form to the researcher, the online questionnaire could not be completed unless consent was obtained.

Participants were provided with a unique ID number to allow them to withdraw up until three months post completion. ID's were either randomly generated by Qualtrics or provided by the researcher. Participants were informed that if they wished to withdraw they could do so by contacting the researcher and quoting their ID number. Participants were also informed that all data would be kept confidential, stored at Ulster University for 10 and handled in line with the approved ethical procedures and policies and procedures at Ulster University. It was also acknowledged that partaking in this study may raise concerns about activity levels and/or the menopause. Additional information on the recommended levels of PA and the menopause was made available to participants to address these issues.

4.3. Results

The results were analysed with a view to describing participant characteristics and explaining and identifying the factors influencing pre-, peri- and post-menopausal women's intentions to perform recommended levels of MPA and MSA, each week. As such the following subsections provides information on participant characteristics, the relationships between TPB variables and intentions, group differences in mean weights for each TPB component and the TPB components predicting intentions for both modes of PA. In keeping with the assumptions of the TPB, logistic regression analyses were computed to determine if intention predicted behaviour within the study sample.

4.3.1. Participant characteristics

In total, this study achieved a sample of 186 females (M_{age} = 47, SD = 9, age range: 30-64 years). Of these, 76 participants were pre- (M_{age} = 38, SD = 5.3), 45 were peri- (M_{age} = 51, SD = 2.5) and 65 were post-menopausal (M_{age} = 55, SD = 4.8). The majority of pre-, peri- and post-menopausal women were married (55%, 62% & 77% respectively) and educational levels were comparable across groups with most women having received a university level education (78%, 78% & 74% respectively).

Health related characteristics are presented in Table 4.3 by menopausal group. The results indicate that the majority of participants BMI scores were within the normal range. A larger proportion of post-menopausal women reported a below average PCS. This trend was reflected in the proportion of women experiencing a long term condition with rates of long term conditions increasing from pre- to post-menopause. A large proportion of pre- and peri-menopausal women reported a below average MCS suggesting that levels of psychological well-wellbeing were lower in these groups.

Table 4.3

Descriptive characteristics of study participants (n=186) information for BMI and physical and mental health by menopausal group

Variable	**Group**		
	Pre (n=76)	**Peri (n=45)**	**Post (n=65)**
BMI range (%)			
Normal	51	42	58
Overweight	29	47	17
Obese	16	11	20
PSC (%)			
Above average	80	76	66
Below average	20	22	34
MCS (%)			
Above average	30	33	45
Below average	67	64	45
Long term health condition (%)	26	27	40

Note. Abbreviations are as follows: PSC = physical component score; MSC = mental component score; BMI, Body Mass Index.; pre = pre-menopausal; peri = peri-menopausal; post = post-menopausal. It should be noted that BMI ranges were classified as follows; normal range 18.5 – 24.99 kg/m2, overweight 25.00 – 29.99 kg/m2 and obese > 30 kg/m2. An average summary score for PCS and MCS was 50. Table 5 presents the percentage of participants scoring above or below 50 for both health components.

MPA and MSA behaviour of the study participants

The percentage of women undertaking minimum recommended levels of PA is presented in Table 4.4 by menopausal group. The results presented indicate a slight increase in the proportion of women undertaking MPA and MSA across menopausal groups with post-menopausal women more likely to achieve recommended levels. However, overall the majority of participants were not meeting recommended levels of MPA or MSA.

Table 4.4

Percentage of participants undertaking minimum recommended levels of MPA and MSA by menopausal group

Physical activity levels	**Group**		
	Pre (n=76)	Peri (n=45)	Post (n=65)
Undertaking minimum weekly recommended levels (%)			
MPA	14	22	26
MSA	8	4	15

Note. Abbreviations: MPA = moderate physical activity; MSA = muscle strengthening activities; pre = pre-menopausal; peri = peri-menopausal; post = post-menopausal.

4.3.2. Correlational analyses between the study variables and intention

A Person's Bivariate correlational analysis was conducted to explore the relationship between the study variables and intention to undertake recommended levels of MPA and MSA.

MPA

Outcomes for MPA are presented in Table 4.5. The results indicate that menopausal status did not correlate with intention to perform MPA, whereas BMI, age and all TPB based variables significantly correlated with intention. Self-efficacy had the strongest relationship with intention followed by affective attitude, instrumental attitude, controllability, injunctive norm, descriptive norm, BMI and age.

MSA

Correlation outcomes for MSA are presented in Table 4.6. The results show that menopausal status, BMI and age did not correlate with intention, whereas all TPB based variables had a positive significant relationship with intention. Self-efficacy emerged as having the strongest relationship with intention followed by affective attitude, instrumental attitude, injunctive norm, controllability and descriptive norm, respectively.

Table 4.5

Pearson's bivariate correlations exploring the relationships between the study variables for MPA

Variable	1	2	3	4	5	6	7	8	9	10
1. Menopausal status	-	**.837****	-.014	**.173***	.059	**.189****	**.161***	.006	**.162***	.114
2. Age	-	-	-0.17	**.202****	.128	**.228****	**.156***	.065	**.254****	**.147***
3. BMI	-	-	-	**.202****	.128	**.228****	**.156***	.065	**.254****	**-.147***
4. Affective attitude	-	-	-	-	**.446****	**.206****	**.313****	**.391****	.077	**.470****
5. Instrumental attitude	-	-	-	-	-	**.361****	.144	**.433****	.127	**.401****
6. IN	-	-	-	-	-	-	**.265****	**.474****	**.439****	**.378****
7. DN	-	-	-	-	-	-	-	**.154***	.080	**.292****
8. SE	-	-	-	-	-	-	-	-	**.439****	**.725****
9. Controllability	-	-	-	-	-	-	-	-	-	**.387****
10. Intention	-	-	-	-	-	-	-	-	-	-

Note. Abbreviations are as follows: BMI = Body Mass Index; age = age in years; IN = injunctive norm; DN = descriptive norm and SE = self-efficacy. A Pearson's Bivariate Correlation analysis was conducted for all participants (pre-menopausal n=76; peri-menopausal, n=45; post-menopausal n=65). Significant correlations are identified in bold *P<0.05; **P<0.01.

Table 4.6

Pearson's bivariate correlations exploring the relationships between the study variables for MSA

Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1. Menopausal status	-	**.837****	-.014	.074	.055	.097	.132	.009	.070	.096
2. Age	-	-	-.017	.037	.084	**.147***	.114	.046	**.158***	.090
3. BMI	-	-	-	-.024	-.096	.093	.114	-.084	-.101	-.050
4. Affective attitude	-	-	-	-	**.583****	**.476****	**.337****	**.484****	.033	**.593****
5. Instrumental attitude	-	-	-	-	-	**.606****	**.202****	**.606****	**.190***	**.586****
6. IN	-	-	-	-	-	-	**.363****	**.522****	**.327****	**.553****
7. DN	-	-	-	-	-	-	-	**.163***	.014	**.285****
8. SE	-	-	-	-	-	-	-	-	**.571****	**.683****
9. Controllability	-	-	-	-	-	-	-	-	-	**.360****
10. Intention	-	-	-	-	-	-	-	-	-	-

Note. Abbreviations are as follows: BMI = Body Mass Index; age = age in years; IN = injunctive norm; DN = descriptive norm and SE = self-efficacy. Pearson's Bivariate Correlation analysis was conducted for all participants (pre-menopausal, n=76; peri-menopausal, n=45; post-menopausal n=65). Significant correlations are identified in bold *P<0.05; **P<0.01.

4.3.3. Correlational analyses belief based measures and intention to perform MPA

A Pearson's Bivariate correlational analysis was used to explore the relationship between belief-based measures and intention to perform recommended levels MPA, each week. Significant findings from these analyses are presented by menopausal group in Table 4.7 and described below.

Pre-menopausal

Pre-menopausal women's intentions were influenced by affective beliefs including: feeling less stressed; feeling better; improved mood, clearing your head and a sense of achievement. Normative referents including family, friends and partners were found to have a positive relationship with intention. Time constraints (i.e. family and work commitments) were found to have an inverse relationship with intention.

Peri-menopausal

Having an opportunity to clear your head and pain emerged as the main behavioural beliefs associated with intention. Normative referents including family, friends and partners were found to have a positive relationship with intention. Having a goal was the only control belief found to have a significant positive relationship with intention. The cost of undertaking PA had a significant inverse relationship within intention.

Post-menopausal

Enjoyment was the only behavioural belief found to have a significant relationship with intention while normative referents found to have a significant relationship with intention were: family, friends, partners and doctors. Control expectancy value items did not correlate with intention.

Table 4.7

A summary of the significant correlations between expectancy value items and intention to undertake MPA

TPB construct	Beliefs	Pre	Peri	Post
Behavioural beliefs	Feel less stressed	.427**		
	Feel better	.300**		
	Improve mood	.208*		
	Achievement	.354**		
	Clear head	.320**	.323*	
	Cause pain		.304*	
	Enjoy doing it			.271*
Normative beliefs	Family	.552**	.552**	.375**
	Partner	.315*	.315*	.370**
	Friends	.445**	.445**	.251*
	Doctor			.379**
Control beliefs	Work commitments	-.284*		
	Family commitments	-.253*		
	Having a goal		.306*	
	Cost		-.456**	

Note. A Pearson's bivariate correlational analysis was undertaken to explore the relationship between individual expectancy formulated belief scores and intention to undertake MPA by menopausal group. Participants were pre- (n=76); peri- (n=45) and post-menopausal (n=65). Significant correlations are identified by *=P<0.05; **=P<0.01. Abbreviations are as follows: pre = pre-menopause; peri- = peri-menopause; post = post-menopause; TPB = Theory of Planned Behaviour.

4.3.4. The effect of menopausal status on mean scores

ANOVA with one within-subjects factor (TPB variable) and one between-subjects factor (menopausal group) for both modes of PA were used to explore differences between groups on TPB variables.

MPA

Mean scores and standard deviations for MPA are presented in Table 4.8. The results indicated a significant difference between groups on mean scores for affective attitude ($F(2, 180) = 3.214$. $p = 0.04$) and mean scores between groups for injunctive norms ($F(2, 183) = 3.442$, $p = 0.03$). Bonferroni post-hoc test revealed that mean affective attitude scores increased between pre- and post-menopausal women however this trend was outside an acceptable significant level (5.4 + 0.46, $p = 0.06$). Bonferroni post-hoc test identified a significant increase in mean scores for injunctive norm between pre- and post-menopausal women (5.82 + 0.5, $p = 0.03$).

There was no effect of menopausal status on mean scores for instrumental attitudes ($F(2,181) = .344$, $p = 0.70$); descriptive norms ($F(2,177) = 2.429$, $p = 0.09$); self-efficacy ($F(2, 178) = 3.21$, $p = 0.72$); controllability ($F(2, 181) = 2.484$, $p = 0.08$) and; intention ($F(2, 180) = 1.220$, $p = 0.29$).

MSA

Mean scores and standard deviations for MSA are presented in Table 4.9. The results indicate that there is no effect of group on mean weights for affective attitudes ($F(2, 180) = .577$, $p = 0.56$); instrumental attitudes ($F(2, 178) = .351$, $p = 0.70$); injunctive norm ($F(2, 180) = .900$, $p = 0.40$); descriptive norm ($F(2, 177) = 1.577$, $p = 0.21$); controllability ($F(2, 183) = .456$, $p = 0.63$); self-efficacy ($F(2, 180) = .675$, $p = 0.51$ or; intention ($F(2, 179) = .865$, $p = 0.42$).

Table 4.8

Means weights and standard deviations for all TPB variables relating to MPA by menopausal group

TPB variables	Pre Mean (SD) (n=76)	Peri Mean (SD) (n=45)	Post Mean (SD) (n=65)
Affective attitude	5.40 (1.15)	5.81 (1.28)	5.86 (1.09)
Instrumental attitude	6.55 (0.59)	6.61 (0.77)	6.63 (0.54)
Injunctive norm	5.82 (1.15)	6.14 (1.36)	6.32 (0.89)
Descriptive norm	3.48 (1.63)	3.88 (1.57)	4.08 (1.60)
Self-efficacy	5.78 (1.32)	5.99 (1.53)	5.79 (1.57)
Controllability	5.65 (1.27)	5.81 (1.51)	6.14 (1.12)
Intention	5.05 (1.80)	5.35 (1.71)	5.05 (1.62)

Note. All TPB variables were scored on a 7-point Likert scale, see section 4.3.2 for more details on how these variables were scored. Seven distinct analysis of variance were computed to explore difference between groups on study variables. Abbreviations are as follows: pre = pre-menopause; peri- = peri-menopause; post = post-menopause; TPB = Theory of Planned Behaviour; SD = standard deviation; n = number.

Table 4.9

Means scores and standard deviations for all TPB variables relating to MSA by menopausal group

TPB Variable	Pre Mean (SD) (n=76)	Peri Mean (SD) (n=45)	Post Mean (SD) (n=65)
Affective attitude	4.72 (1.65)	4.98 (1.55)	4.98 (1.65)
Instrumental attitude	6.12 (1.03)	6.26 (1.04)	6.25 (1.01)
Injunctive norm	5.27 (1.45)	5.51 (1.62)	5.59 (1.33)
Descriptive norm	3.08 (1.43)	3.31 (1.50)	3.54 (1.57)
Self-efficacy	5.37 (1.51)	5.70 (1.60)	5.39 (1.62)
Controllability	5.63 (1.47)	5.78 (1.49)	5.86 (1.28)
Intention	4.26 (1.95)	4.55 (1.92)	4.68 (1.88)

Note. All TPB variables were scored on a 7-point Likert scale, see section 4.3.2 for more details on how these variables were scored. Seven distinct analysis of variance were computed to explore difference between groups on study variables. Abbreviations are as follows: pre = pre-menopause; peri- = peri-menopause; post = post-menopause; TPB = Theory of Planned Behaviour; SD = standard deviation; n = number.

4.3.5. Predictors of intention to perform MPA and MSA intention

Two hierarchical multiple regression analyses were computed to identify the factors predicting women's intention to undertake minimum weekly recommended levels of MPA and MSA. Outcomes are presented in Table 4.10.

MPA

Age, BMI, level of education and menopausal status were entered in step one and accounted for 4% of the variance in intentions. There was a significant change in R^2 with the addition of the TPB variables in step two, accounting for an additional 53% of the variance in intentions. The final model explained 57% of the variance with self-efficacy ($spc^2 = 0.287$), affective attitudes ($spc^2 = 0.044$) and descriptive norms (spc^2

= 0.029) contributing to the prediction of intention as indicated together with higher levels of perceived capability (β = .578, $p < 0.001$), more favourable affective attitudes (β = .168, $p = 0.07$) and the perception that family, friends and work colleagues were meeting weekly recommended levels of MPA (β = .126, $p = 0.27$) increased women's intentions to undertake minimum weekly recommended levels of MPA.

MSA

Intention to undertake MSA was unrelated to socio-demographics, menopausal status, age, or BMI in step one of the model. However, there was a significant change in the R^2 with the addition of the TPB variables, accounting for 58% of the variance in intention. The final model explained 60% of the variance with self-efficacy (spc^2 = 0.11) and affective attitudes (spc^2 = 0.09) making a unique contribution to the prediction of intention., indicating that intention to undertake minimum weekly recommended levels of MSA is increased in women with more favourable affective attitudes towards undertaking the behaviour (β = .279, $p <0.001$) and those with higher levels of perceived capability (β = .382, $p<0.001$).

Table 4.10

Summary of the hierarchical regression analyses for each mode of PA as dependent variables, and socio-demographics, menopausal status, BMI and TPB variables as predictor variables

Dependent variable	**Model**	**Predictor variables**	**R^2**	**ΔR^2**	**F**	**P**
Intention to perform MPA	1	Socio-demographics, menopausal status and BMI	**.071**	**0.44**	**F(5, 170) = 2.60**	**0.02**
	2	TPB variables	**.600**	**.573**	**F(6, 154) = 33.42**	**<0.001**
Intention to perform MSA	1	Socio-demographics, menopausal status and BMI	.018	-.041	F(10, 165) = .304	0.97
	2	TPB variables	**.602**	**.562**	**F(6, 159) = 15.02**	**<0.001**

Note. The first step in the regression analysis involved entering socio-demographic information of age, educational level, marital status, menopausal status and BMI. In step two the TPB variables affective and instrumental attitude, injunctive and descriptive norm, perceived behavioural control and self-efficacy were entered. It should be noted that step two includes the variables from step one. Significant increases in R^2 indicated in bold.

4.3.6. Predictors of MPA and MSA behaviour

Two logistic regression analyses were used to explore the relationship between intention and behaviour. For both modes of PA, age, BMI and menopausal status (post-menopause was used as the reference class) were included in Step 1, affective and instrumental attitudes; injunctive and descriptive norm; self-efficacy and controllability were added in Step 2 with intention added to the model in Step 3. The results of these analyses are described below.

MPA

Outcomes for the final model are presented in Table 4.11. The full model containing all predictors variables were statistically significant ($x^2(11, N = 139) = 28.794$, $p = 0.02$), indicating that the model was able to distinguish between respondents who were and were not undertaking recommended levels of MPA.

When age, BMI and menopausal status was added to the model in step one, menopausal status made a unique contribution to the model ($\beta = 1.94$, $p = 0.037$). With post-menopausal status used as a reference class and an odds ratio of 7.010, the findings suggest that as women move from pre- to post-menopause they were 7 times more likely to achieve recommended levels of MSA. When the TPB variables were added in step two, 22% of the variance (Nagelkerke R squared) in MSA behaviour was explained by these variables. However, menopausal status, age and affective attitude were the only factors to significantly contributions to the model. Age and menopausal status continued to contribution to the model in step three. Intention also made a unique contribution to the model, the results indicate a trend between affective attitude and behaviour. However, the significance level for affective attitude was just outside

an acceptable level in the final model (p=0.62). The final model explained 27% of the variance in MPA behaviour and correctly classified 80.6% of cases.

MSA

Outcomes for the final model are presented in Table 4.12. The full model containing all predictors variables was significant ($\chi^2(11, N = 168) = 57.001$, p=0.00), indicating that the model was able to distinguish between respondents who were and were not undertaking recommended levels of MSA.

The variables added in step 1of the analysis did not make a unique contribution to model. However, when the TPB variables were added to the model in step 2, the model explained 46% of the variance (Nagelkerke R squared) in MSA behaviour. However, self-efficacy was the only component to make a unique statistically significant contribution to the model ($\beta = 2.15$, $p = 0.02$): with an odds ratio of 8.64, the results indicate for 1unit increase in self-efficacy scores respondents were over 8 times more likely to achieve recommended levels of MSA. However, intention was the only variable to make a significant unique contribution to the variance explained by the model in step 3. The final model explained 61% of the variance in MSA behaviour and correctly classified 92.9 % of cases.

Table 4.11

Summary of logistic regression analysis for MPA behaviour as the dependent variable and age, BMI and TPB variables as predictor variables

Model	Predictor variables	β	S.E.	Wald	df	P	Odds ratio	95.0% C.I. for Odds Ratio	
								Lower	Upper
1	**Age**	**-.124**	**.056**	**4.895**	**1**	**.027**	**.884**	**.792**	**.986**
	BMI	-.004	.051	.005	1	.945	.997	.901	1.102
	Pre-	**2.141**	**1.082**	**3.917**	**1**	**.048**	**8.509**	**1.021**	**70.92**
	Peri	.660	.616	1.150	1	.284	1.935	.579	6.467
2	Affective attitude	.591	.317	3.480	1	.062	1.805	.971	3.357
	Instrumental attitude	-.568	.493	1.329	1	.249	.567	.216	1.488
	Injunctive norm	.024	.289	.007	1	.934	1.024	.581	1.805
	Descriptive norm	.098	.162	.365	1	.546	1.103	.802	1.517
	Self-efficacy	-.363	.351	1.068	1	.301	.696	.350	1.384
	Controllability	.250	.262	.906	1	.341	1.284	.768	2.146
3	**Intention**	**.722**	**.338**	**4.570**	**1**	**.0.34**	**2.059**	**1.062**	**3.992**

Note. Age, BMI and menopausal status was entered in step 1, the TPB variables were entered in step 2 and intention entered in step 3 of the analysis. The post-menopause group were used as the reference class. Abbreviations are as follows: pre = pre-menopause; peri =peri-menopause; β=beta; S.E=standard error; df=degrees of freedom; P=probability value; CI=confidence level)

Table 4.12

Summary of logistic regression analyses for MSA behaviour as the dependent variable and age, BMI and TPB variables as predictor variables

Model	Predictor variables	β	S.E.	Wald	df	P	Odds ratio	95.0% C.I. for Odds Ratio	
								Lower	Upper
1	Age	.077	.110	.493	1	.483	1.081	.965	1.341
	BMI	-.014	.101	.018	1	.893	.987	.810	1.201
	Pre	0.63	1.812	.001	1	.972	1.065	.031	37.13
	Peri	1.55	1.140	1.870	1	.171	4.755	.509	44.43
2	Affective attitude	-.482	.485	.989	1	.320	.618	.239	1.579
	Instrumental attitude	-.460	1.515	.092	1	.761	.631	.032	12.284
	Injunctive norm	.154	.457	.113	1	.737	1.166	.476	2.858
	Descriptive norm	.135	.254	.284	1	.594	1.145	.696	1.883
	Self-efficacy	.268	1.174	.052	1	.819	1.308	..131	13.06
	Controllability	.296	.549	.289	1	.591	1.344	.458	3.945
3	**Intention**	**3.427**	**1.5.1**	**5.209**	**1**	**.022**	**30.77**	**1.623**	**583.8**

Note. Age, BMI and menopausal status was entered in step 1 model, the TPB variables were entered in step 2 model and intention entered in step 3 model of the analysis. Abbreviations are as follows: pre = pre-menopause; peri =peri-menopause; β=beta; S.E=standard error; df=degrees of freedom; P=probability value; CI=confidence level.

4.4. Discussion

To my knowledge this was the first study to identify and explain the factors that influence pre-, peri- and post-menopausal women's intention to undertake weekly recommended levels of MPA and MSA, with a view to informing the design of an intervention for these populations. The present study found that affective attitudes and self-efficacy predicted intentions to undertake MPA and MSA while descriptive norm was found to predict MPA but not MSA intentions. These results were independent of menopausal status. However, beliefs underlying pre-, peri- and post-menopausal women's intention to undertake MPA differ slightly based on menopausal status.

The findings indicate that self-efficacy plays a fundamental role in the formulation of pre-, peri- and post-menopausal women's intention to undertake recommended levels of MPA and MSA. This finding is consistent with previous PA research that includes a self-efficacy component within the TPB (Bauman et al., 2012; Trafimow et al., 2002; Vallance et al. 2011). Similarly, previous research has also identified PBC as a key component in the formation of intention (Bryan & Rocheleau, 2002; Dean et al. 2007; Downs & Hausenblas, 2005). However in contrast to the present study findings, self-efficacy has not always been included within the TPB as a distinct component but combined with controllability to form PBC. Given the proportion of variance in intention explained by self-efficacy, it is possible that this component drives the relative importance and predictive ability of PBC. Nonetheless, as the findings from this study illustrated that a higher level of self-efficacy results in a higher level of intention, an intervention that aims to increase MPA and MSA should include components that target this concept. Given that knowledge has been consistently reported as a key determinant of intentions (Devoy & Simpson, 2016; Giles et al. 2010)

increasing women's awareness of weekly recommended levels of MPA and MSA and, how to perform these behaviours may increase women's sense of self-efficacy. Thus, techniques including: instructions on how to perform behaviour; reviewing behavioural goals; demonstration of behaviour and modelling could increase women's sense of self-efficacy towards undertaking MPA and MSA.

Beliefs that underpin women's intention to perform MPA were explored in the current study, with a view to informing the behaviour related information provided within an intervention. However, this research only explored beliefs relating to MPA as previous research indicated that beliefs underlying these women's decision to perform MSA were not well established (see Chapter three). Nevertheless, as changes in the model constructs can be achieved through targeting underlying beliefs (Fishbein & Ajzen, 2010), the present findings suggest that information relating to MPA should be tailored to reflect menopausal status. In recognition of this, the present findings suggest that pre-menopausal women should receive information on how to overcome time constraints and aligns with previous research (Belanger-Gravel et al. 2012). In contrast, peri-menopausal women would benefit from information on free PA opportunities and goal setting. The present research did not identify any control beliefs underlying post-menopausal women's intention to undertake MPA. Nonetheless, addressing the control issues related to MPA intentions would in principle have the potential to increase women's sense of self-efficacy.

The current study found that participation in MPA and MSA is associated with women's attitudes toward these behaviours. However, it emerged that women's intentions appear to be influenced by the affective component of attitudes (i.e. their feelings towards the behaviour) rather than the instrumental component (i.e. the extent

to which performing a behaviour would be advantageous). The present findings are consistent with previous health behaviour research (Conner, McEachan, Taylor, O'Hara & Lawton, 2015) and PA studies (Conner, Rhodes, Morris, McEachan & Lawton, 2011; Lowe, Eves & Carroll, 2002) that explore these components of attitude separately. Given that affective attitudes were found to contribute to the formation of intention in the current study, future interventions for the target populations should aim to promote positive affective attitudes towards undertaking recommended levels of MPA and MSA. This may be achieved indirectly by increasing women's knowledge of weekly recommended levels of MPA and MSA and, the associated benefits. However, a recent review of intervention studies by Rhodes and Kates (2015) suggests that affective responses during PA influence future PA. Thus, reflecting on affective responses during both modes of PA may increase women's overall affective attitude towards these behaviours. Others have reported changes in affective responses by including motivational music (Karageorghis & Priest, 2012). Furthermore, interventions that incorporates techniques such as: monitoring of behaviour; reviewing progress and rewards could enhance women's affective attitudes towards undertaking MPA and MSA.

In relation to the underlying beliefs found to influence intention, the findings suggest that presenting information on the pros and cons of undertaking MPA may increase women's affective attitudes and intention towards undertaking MPA. For example, providing pre-menopausal women with information on the affective responses of undertaking MPA (i.e. feel less stressed; feel better; improved mood; sense of achievement and clears your head) could increase their intention to undertake MPA. Peri-menopausal women's intention to undertake MPA could be enhanced by promoting PA as an opportunity to clear your head. The findings showed that

enjoyment was the most import aspect of PA for post-menopausal women and is related with intention. This finding was in line with previous research identifying enjoyment as an important factor in adult's decision to undertake PA (Allender, Cowburn & Foster, 2006).

In the current study, descriptive norm was found to predict intention to undertake MPA but not MSA. Thus, indicating that women who have family, friends or work colleagues typically achieving the recommended levels of MPA reported higher rates of intention to undertake this behaviour. This finding supports the results of previous research explicitly exploring descriptive norm (Rivis & Sheeran, 2003; Vallance et al. 2011). It is notable that mean scores for descriptive norm within the study sample were relatively low (i.e. 3.48, 3.88, 4.08 for pre-, peri- and post-menopausal participants respectively), suggesting that a considerable increase in descriptive norm could be achieved with a view to increasing intention. Thus, future interventions should include techniques such as: social support (practical) to increase descriptive norms among women.

The current study found that pre- and post-menopausal women's intentions to undertake MPA was influenced by family, partners and friends, while post-menopausal women's intention to undertake MPA were influenced by family, partners, friends and doctors. Thus, suggesting that these individuals play an important role in these women's decision to undertake MPA. Within the TPB the expectancy formulated items ask respondents how likely it is that significant others expect them to undertake the target behaviour. This item is multiplied by the corresponding motivation to comply, which asks respondents to indicate whether or not they generally want to do what others expect them to do, therefore these items typically reflect injunctive norms.

However, injunctive norm was not a significant predictor of intention to undertake MPA in the present study, suggesting that social pressure was not important in the formation of intention. It is possible that these individuals influence women's decision to undertake MPA (e.g. undertaking MPA with a family member; partner/friend; or for post-menopausal women being directly told to undertake MPA by their doctor).

The present study provides support for the utility of the two component framework of the TPB, with affective attitudes, descriptive norm and self-efficacy emerging as the most significant predictors of intention to undertake MPA and MSA. The final model accounted for 52% and 58% of the variance in intention to undertake MPA and MSA respectively. This is slightly higher than previous research (Hagger et al. 2002; McEachan et al. 2011). However, measuring the TPB components separately may have given rise to this. Given that previous TPB-based research has been criticised for using intention as a proxy for behaviour, the current study sought to explore the intention behaviour relationship. The results from the current study showed that the final model (i.e. age, BMI, menopausal status and TPB variables) accounted for 27% of the variance in undertaking recommended levels of MPA and 61% of the variance in undertaking recommended level of MSA. It is notable, that in the final model, intention was the only variable to make a significant contribution to behaviour for both modes of PA. However, based on previous research, future interventions should consider behaviour change techniques such as: action plans and habit formation that aid the implementation of MPA and MSA intentions, with a view to improving the effectiveness of the intervention and reducing the intention-behaviour gap.

4.4.1. Limitations

An acknowledged limitation of the present study was the approach taken to determine menopausal status, which relied on self-reported information from participants to categorise menopausal status. Although using age and characteristics of menses is common practice, more objective methods of determining menopausal status (such as assessing hormone levels) would have been preferable, assessing hormone levels was not feasible in the present study. While the sample size was adequate for the statistical analyses used in this research, it is recognised that undertaking this research across the UK and Ireland would have provided more generalisable results, which in turn, could be used to inform the design of an intervention that could be applied nationally. Nonetheless the findings add to the current body of literature and are a valuable source of information for designing interventions for the target groups in NI. Finally, it should be noted that the majority of respondents were university educated which is an acknowledged limitation of this research and may account for the rise in MPA and MSA with age that was noted in this study.

4.4.2. Conclusions

In line with the aims of the present study, the findings illustrate the need for future interventions aimed at improving participation in MPA and MSA to target women's sense of self-efficacy and affective attitudes across menopausal phases. Intervention components should target descriptive norms in relation to MPA. As the TPB components predicting intention were independent of menopausal status, interventions (and intervention components) seeking to increase MSA could do so across all

menopausal phases. However, in relation to MPA, the behaviour related information provided within the intervention should be tailored to reflect differences based on menopausal status. These results provide direction for researchers and health professionals interested in developing theory-based interventions to promote weekly recommended levels of PA in women. This research also provides support for the utility of the two component model of the TPB, suggesting that the variance in intention to undertake MPA and MSA could be further understood by adopting this framework with diverse populations.

4.5. References

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Chapter 5

The feasibility and acceptability of a Theory of Planned Behaviour-based intervention to promote pre- peri- and post-menopausal women's participation in minimum recommended levels of physical activity

5.0. Abstract

Background: This chapter presents the third phase of this work. Thus, the aim of this study was to design, implement and evaluate the feasibility and acceptability of a theory-based intervention to promote pre-, peri- and post-menopausal women's participation in minimum recommended levels of physical activity, specifically moderate physical activities and muscle strengthening activities.

Methods: This study employed mixed methods and involved two stages of research. Stage one was a randomised controlled trial, in which participants were allocated to an intervention group (n=10) or control group (n=7). In stage two, interviews were undertaken to explore the acceptability of the intervention and components. Outcome variables in stage one were measured at two time points (i.e. pre- & post-intervention) and analysed using descriptive statistics, independent T-Tests, mixed repeated measures ANOVAs and a Wilcoxon signed rank test. Qualitative data collected in stage two were analysed using thematic analysis.

Results: The results revealed a significant time by group interaction on affective attitudes ($F_{1, 15} = 7.80$, p=0.014) and self-efficacy ($F_{1, 15} = 5.163$, p=0.038) towards undertaking MPA and a significant time by group interaction on affective attitude ($F_{1, 15} = 8.596$, p=0.01), instrumental attitudes ($F_{1, 15} = 4.960$, p=0.042), descriptive norms ($F_{1, 15} = 6.27$, p=0.024) and intention ($F_{1, 15} = 9.79$, p=0.007) towards undertaking MSA. There was no significant differences post-intervention on light, moderate or vigorous PA. Overall, participants were satisfied with the intervention. However, rewards, monitoring of emotional consequences and social support (practical) components were unpromising in the current context.

Conclusions: The findings from this study suggest that the intervention is feasible and acceptable to pre- and post-menopausal women. The intervention should be refined and a larger scaled evaluation undertaken to determine its effectiveness.

5.1. Introduction

Chapter three and four of this work reported the first two phases of research required to inform the design of an intervention based on the Theory of Planned Behaviour (TPB). The current chapter presents the third and final phase of the empirical research included in this work. That is, the design, implementation and initial evaluation of a TPB-based intervention to promote pre-, peri- and post-menopausal women's participation in recommended level of moderate physical activities (MPA) and muscle strengthening activities (MSA).

Previous research has used the TPB to inform intervention designs. This research provides insight on the effectiveness of TPB based interventions and the active components (e.g. Conner et al. 2011; Darker et al. 2010; Giles et al. 2014; Godin et al. 2011; Hardeman et al. 2002). For example, Hardeman et al. (2002) conducted a systematic review of interventions studies using the TPB. The review comprised of 24 papers and found that intervention components such as persuasion and information were commonly used while behavioural techniques such as goal setting and rehearsal of skills were used less often. Although the interventions included in the review were rarely explicit about how the framework was used to inform the design, the results found that half of the studies were effective in changing intention and two thirds in changing behaviour.

Additional support for the application of the TPB is provided by Darker et al. (2010) who developed an intervention based on extensive formative research guided by the TPB, with a view to promoting walking in the general population. The results showed an increase in control beliefs, attitudes and intention following the intervention. More

recently, Maher et al. (2015) found that a TPB web-based social networking intervention increased adults moderate/vigorous PA (MVPA) by 135 minutes.

However, it is argued that interventions are often developed without an understanding of how the target population received the intervention components (Ayala & Elder, 2011). Guidance for developing and evaluating interventions provided by the Medical Research Council (MRC) recognises this issue and emphasises the importance of undertaking a series of evaluations during the design process (Craig et al, 2013; Moore et al. 2015). According to the MRC, the first stage of an evaluation involves assessing the feasibility and acceptability of the intervention. It is suggested that this initial evaluation is fundamental to the future effectiveness of the intervention and as such should be undertaken before progressing to a full-scale study (Sekhon & Cartwright, 2017). Given this, research evaluating the feasibility and acceptability of interventions have emerged using quantitative (McMahon et al. 2016), qualitative (Webster, Thompson, Norman & Goodacre, 2017) and mixed methodologies (Moitra, Gaudiano, Davis & Ben-Zeev, 2017), with a view to further developing and improving the effectiveness of these interventions. Thus, given the aims of this work, it is important that an intervention designed using the TPB to promote pre-, peri- and post-menopausal women's participation in minimum recommended levels of MPA and MSA, is implemented and the feasibility and acceptability explored. From this, the intervention design can be further developed before progressing to a larger study and evaluation.

5.1.1. Aim

The aim of the research presented in this Chapter was to explore the feasibility and acceptability of a TPB based intervention to promote pre-, peri- and post-menopausal women's participation in minimum recommended levels of MPA and MSA.

5.2. Methodology

This study employed mixed methods (Creswell & Clark 2003) and as such involved two stages of research. Stage one was a randomised controlled trial using quantitative methodology to explore the study outcomes: level of PA; TPB components and the extent that post-menopausal women experience menopausal symptoms. Stage two used qualitative methodology to explore the acceptability of the intervention in the target populations at stage two.

5.2.1. Stage one: randomised controlled trial

5.2.1.1. Participants and randomisation

Women aged 30-64 yrs were recruited from Ulster University and community organisations that serve women in NI using convenience and snowballing sampling techniques. A sample of 21 women was proposed based on a power calculation performed using GPower (Erdfelder, Faul & Buchner, 1996) with an effect size of f^2=.40, α=0.05 and a power of .81 Inclusion criteria were as follows: inactive, defined as not achieving minimum recommended levels of MPA and MSA; aged 30-64 yrs; no

known health conditions such as hypertension, diabetes, heart disease etc. as defined by the Physical Activity Readiness Questionnaire [PARQ] (Adams, 1999). Exclusion criteria were as follows: aged <30 or >64 yrs; have a known health condition; currently achieving recommended levels of PA as assessed by the IPAQ-SF (IPAQ-SF, 2003) and individuals receiving hormone therapy.

Menopausal status was determined using based on the following: women aged 30-64 years; women <48 years of age reporting regular menses were included as pre-menopausal; women >40 years of age but less than 55 years reporting irregular menses were included as peri-menopausal; and women reporting cessation of menses for >12 months due to the menopause were included as post-menopausal. Menopausal status for participants reporting a hysterectomy or use of contraception was determined based on the following criteria: pre-menopausal, <48 years; peri-menopausal >48 years but <55 years of age; and post-menopausal >55 years. Exclusion criteria were as follows: self-reported bilateral salpingo-oophorectomy. Past research has adopted a similar approach (Simpson & Thompson, 2009)

Women meeting the inclusion criteria were assigned a unique ID and randomly allocated to an intervention or control group. A computerised random allocation programme within SPSS V24 was used to achieve this. The randomisation process was conducted by an independent researcher who was not part of the study. Sealed opaque envelopes containing group allocation were prepared by the independent researcher. Participants were given the envelope after baseline measures were collected. Therefore, the researcher responsible for recruitment and implementing the intervention was blinded to group allocation until baseline measures were collected.

5.2.1.2. Design and content of the intervention

Over the years, cognitive and behavioural interventions have become a popular method of changing health behaviours, including PA. Despite this, the proportion of women achieving the level of MPA and MSA required to produce health benefits remains low across the life course. There are a number of explanations why interventions to increase PA have been met with limited success. For example, it is possible that previous interventions have not been adequately evaluated or refined before being implemented on a larger scale; the most appropriate cluster of intervention components for changing PA may yet to be established; interventions may not target determinants of PA on multiple levels (i.e. personal; social; environmental/policy) which can impact on the success of an intervention. Moreover, interventions selected for implementation within society may not be the most effective or lack a theoretical underpinning. The work included in this thesis aims to build upon previous research by drawing upon the TPB to guide the intervention and evaluating the feasibility and acceptability of the intervention components before making recommendations on how the intervention could be administered on a larger scale.

In keeping with the advice of Ajzen (2011), two sequential phases of formative research were undertaken and drawn upon to inform the intervention design: (1) an exploration of the target populations attitudes and motivations towards undertaking minimum recommended levels of MPA and MSA and; (2) a TPB based survey to identify and explain the factors that influence the target populations intention to undertake minimum recommended levels of MPA and MSA. The intervention was designed to include behaviour related information and components that reflected the findings from phase one and two of this research. The taxonomy of behaviour change

(Michie, et al. 2013), a comprehensive list of 93 behaviour change techniques with definitions was drawn upon to identify and standardise the reporting of the behaviour change components included in the intervention. Table 5.1 presents an overview of TPB constructs targeted within the intervention, selected behaviour change techniques and accompanying materials. A more detailed summary of the content of the intervention is provided below.

Table 5.1

Summary of the theoretical components targeted within the intervention, BCTs and accompanying material for weeks 1-2

Week	Theoretical components	BCTs		Accompanying material	
1	Self-efficacy Affective attitudes Intention	Instructions on how to perform the behaviour Information on health consequences Pros and Cons	Goal setting (outcome) Self-monitoring of behaviour Prompts/cues	Behaviour change diary Goal setting worksheet Factsheet: PA guidelines for adults aged 18-69 years.	Borg intensity scale Factsheet: Menopause Introductory leaflet on MSA
2	Self-efficacy Affective attitude Intention	Review of behavioural goals Goal setting (outcome) Focus on past behaviour Problem solving Habit formation Action planning	Self-monitoring of behaviour Prompts/cues Demonstration of behaviour and Modelling (MSA)	Goal setting worksheet If-then worksheet	Behaviour change diary Borg intensity scale

Note. Table 5.1 presents an overview of the TPB components targeted within the intervention, the intervention components (i.e. BCTs) and accompanying material. . Intervention group n=10. Abbreviations are as follows: BCTs = behaviour change techniques.

Table 5.1 Continued

Summary of the theoretical components targeted within the intervention, BCTs and accompanying material for weeks 3-4

Week	Theoretical components	BCTs		Accompanying material	
3	Self-efficacy Affective attitudes Intention	Review of behavioural goals Focus on past behaviour Goal setting (behaviour) Problem solving Action planning Self-monitoring of behaviour	Promote/cues Habit formation Monitoring of emotional consequences Rewards	Goal setting worksheet If-then worksheet	Behaviour change diary Borg intensity scale
4	Self-efficacy Affective attitudes Intention Descriptive norm (MPA)	Review of behavioural goals Focus on past behaviour Goal setting (behaviour) Problem solving Habit formation Rewards Practical social support (MPA)	Action planning Self-monitoring of behaviour Promote/cues Monitoring of emotional consequences	Goal setting worksheet If-then worksheet	Behaviour change diary Borg intensity scale

Duration of the intervention

Previous research has shown that brief interventions have the potential to be a cost-effective method of increasing PA (Vijay, Wilson, Suhrche, Hardeman & Sutton, 2015). As time constraints were identified as one of the main barriers to participation it was decided that the intervention would run for four weeks and involve weekly 1 hour consultation sessions. The intervention was also designed to include one PA class with a trained instructor who would demonstrate a range of MSA. Consequently, participants were required to complete a consultation session and a PA class during the second week of the intervention.

Initial findings (Chapter three) suggested that pre- and post-menopausal women would benefit from the support and accountability associated with undertaking a face to face intervention. Therefore, the intervention was designed to be delivered to these women in person. Peri-menopausal women appeared to be more self-determined than their pre- and post-menopausal counterparts. Given this, it was decided that these women would attend pre and post intervention sessions to collect outcome measures and attend the PA class. The remaining consultation sessions were designed to be delivered online and would involve communicating via email and completing weekly activities available on a website created for the purposes of this research (Appendix 1).

Week one

Given the behaviour related information found to influence pre-, peri- and post-menopausal women's decision to undertake recommended levels of MPA and MSA in the first phase of the research process, week one focused on providing information and increasing women's knowledge of these behaviours. Consequently, a leaflet on the

recommended levels of PA and a leaflet containing information on a number of MSA were discussed and given to participants. The associated physical and psychological benefits (e.g. reduced risk of diseases; maintains healthy weight; improved bone health and improve psychological well-being) were discussed with participants, the pros and cons of undertaking these behaviours were also discussed but were tailed to reflect differences based on menopausal status (see Appendix 3 for full list of pros and cons discussed).

The importance of undertaking at least moderate intensity PA was emphasised and the Borg scale of perceived rate of exertion (Borg, 1982) used to explain appropriate intensity of activities. Participants were asked to use this scale to help determine the intensity of their activities during the next seven days. Behavioural components such as goal setting; self-monitoring and prompting practice that have been linked with changes in PA in previous research (e.g. Greaves et al. 2011; Shilts, Horowitz & Townsend, 2004), were included in the intervention design with a view to increasing participant's level of intention and supporting the implementation of intention.

After participants were provide with all the relevant information they were encouraged to set PA goals. These included both MPA and MSA outcomes. Women were encouraged to define their goals in terms of when, where, what and with whom but advised to increase their levels of MPA and MSA slowly. These goals were reviewed and agreed by the researcher before participants were asked to complete their behaviour change diary and record their activity in the diary for the next week. Prior to week two, participants received one SMS prompt. The SMS was typically sent between day 3 and 7, with a view to encouraging participants to fulfil their weekly goals.

Week two

Affective attitudes and self-efficacy were found to influence women's intention to perform recommended levels of MPA and MSA. As such, additional BCTs were included in week two to: encourage women to reflect positively on their experiences; increase women's confidence in their ability to perform MPA and MSA; support women in implementing their intentions to perform MPA and MSA.

To achieve this, participants were asked to review their progress discussing how well they met the previous week's goals and the factors that influenced their progress. The activities undertaken that week were discussed and participants asked to identify the activity they enjoyed the most. Depending on progress, new weekly goals were set or the previous week's goal modified, planning how, when and where the goal related behaviour would occur.

Participants were then asked to identify issues that may hinder their progress and complete an "if-then" worksheet with the aim of prompting rehearsal and repetition of the behaviours. Behaviour change diaries were completed before the end of the consultation and participants asked to record their progress and bring the diary to their next session. Participants received one SMS three to seven days after the consultation, with a view to encouraging them to reach their weekly goals.

Participants also attended a 45 – 60 minute activity class led by a trained instructor who demonstrated a range of MSA, participants undertook these activities during the class. This component was included in the intervention to increase women's knowledge of MSA and their ability to perform these. The behavioural techniques

included in week two have been used previously in health related interventions (Cradock, OLaighin, Finucane, Gainforth, Quinlan & Ginis, 2017).

Week three

The BCTs included in week two of the intervention were also implemented in week three. Monitoring of emotional consequences and rewards were added to the intervention design to encourage participants to reflect on positive emotional changes following participation in MPA and MSA. It was thought that raising awareness of the emotional benefits and rewarding success would increase affective attitudes. Specifically, participants discussed how well they met the previous week's goals and the factors that influenced whether or not they attained their goals. The researcher discussed the activities engaged in and which were enjoyed. Depending on progress, new weekly goals were set or the previous week's goal modified, planning how, when and where the goal related behaviour would occur.

Participants were asked to identify issues that may have hindered their progress and complete an if-then worksheet with the aim of prompting rehearsal and repetition of the behaviours. Participants received a copy of the Physical Activity Affect Scale (Lox, Jackson, Tuholski, Wasley & Treasure, 2000) and were asked to complete this scale before and after completing their goals throughout the week thus, self-monitoring emotional consequences of undertaking MPA and MSA.

Participants were also asked to identify a reward for completing their goals and asked to record these in their behaviour change diary. PA goals for the next seven days were written into the diary and participants asked to monitor their PA behaviour over the

next seven days. One SMS prompt was sent to participants between 3 to 7 days after setting their goals.

Week four

In addition to covering the content of week three, practical social support was added to the intervention design to target descriptive norms. Based on the definition of practical social support provided by the Taxonomy of Behaviour change (Michie, 2013), participants were asked to identify a family member, friend or work colleague who was physically active and asked to arrange a time (in line with goals and planning) to complete one or more of their weekly goals together.

Participants received one SMS prompt to encourage them to fulfil their weekly goals. When participants returned in week five, their progress was discussed, and participants were signposted to a range of PA opportunities.

5.2.1.3 Measures

5.2.1.4. Screening questionnaire

The screening questionnaire comprised of three sections. Section one collected personal details (i.e. email and; mobile number), demographic information (i.e. age; educational attainment level and; marital status), and menstrual cycle characteristics (i.e. “Are you receiving hormone replacement therapy”; “In the last 12 months have you experienced a menstrual cycle? If so”; “would you describe your menstrual cycle as regular or would you describe your menstrual cycle as irregular”; “If you have not had a menstrual cycle in the past 12 months, how long has it been since your last

menstrual cycle" and; "Please indicate why you have not experienced a menstrual cycle for more than 12 month" has your menstrual cycle stopped" and; "if your menstrual cycle has stopped what is the reason for this").

PA readiness was assessed in section two of the questionnaire and included 19 questions derived from the Physical Activity Readiness-Questionnaire [PAR-Q] (Adams, 1999). A yes or no response format was used to determine if potential participant's had any health problems such as diabetes, known heart disease, asthma and high cholesterol. The PAR-Q is frequently used for this purpose (Duncan et al. 2016).

In section three, the International Physical Activity Questionnaire-Short Form [IPAQ-SF] (IPAQ-SF, 2003) was used to determine if participants were currently undertaking recommended levels of MPA. The IPAQ-SF has been validated in an adult sample (Craig et al. 2003) and comprises of seven questions. Three items assess the number of days (in the last seven days) respondents have undertaken VPA, MPA and walking for more than 10 minutes at a time (e.g. during the last 7days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics or fast bicycling?). Three further items assessed how much time they spent doing VPA, MPA and walking on one of those days (e.g. how much time did you usually spend doing vigorous physical activities on one of those days?). The final item in the IPAQ-SF related to sedentary behaviour and asked respondents to recall how much time they spent sitting on a week day. Responses were scored in line with the guidelines for data processing and analysis of the IPAQ-SF (IPAQ, 2005). Consequently, PA levels were categorised as low, moderate or high based on their answers. Respondents categorised as highly active were considered as obtaining at least 150 minutes of MPA. Two

additional questions were included to determine if participants were meeting recommended levels of MSA. These measured frequency (in days) and the area of the body they worked during these MSA (e.g. legs, arms, back, hips, chest, abdomen and shoulders). Respondents undertaking MSA that work the legs, arms, back, hips, chest, abdomen and shoulder on 2 days were considered as meeting minimum recommended levels of MSA.

5.2.1.5. Outcome measures

Average daily activity levels

PA was measured objectively using the RT3 research activity monitor (Stay Healthy, Monrovia, CA, USA) The RT3 is an accelerometer that detects and records motion on 3-Axis and is wore on the waist. Participants were asked to wear the monitor at two time points (pre- and post-intervention) for seven days. In line with procedures used to standardise data obtained from RT3 monitors (Chen, Jerome, Laferriere, Young & Vollmer, 2009), days with >8hrs wear time were considered as valid days. Only data with at least three days valid wear time that included at least one weekend day were included in the analysis. The results were reported as METs and the cut off points used by Ainsworth et al. (2000) to code the intensity of specific activities were drawn upon to categorise METs into time spent is specific PA intensities (i.e. light, moderate & vigorous). Thus, METs >1 but < 2.9 were considered as light intensity activities, METs > 3 but < 5.9 were considered moderate intensity and vigorous intensity was considered as METs >6. Similar to previous research (West, Ma, Chaudhry, Thomas & Lok, 2017) each minute of light, moderate and vigorous PA was summed separately

for each valid day. Average time spent in light, moderate and vigorous activity was obtained by dividing the summed score by the number of valid days of wear time to estimate daily averages of MPA and MSA in minutes for each participant.

Muscle Strengthening Activities

Participants were provided with a physical activity diary to record levels of MSA at two time points (pre- and post-intervention) and asked to record the number of days, types of MSA undertaken (including sets and repetitions) and the length of time spent doing these activities for seven days. Number of days was multiplied by duration and used as a measure of MSA. Higher scores indicated higher levels of MSA.

TPB variables

The components of the TPB (i.e. affective and instrumental attitudes; injunctive and descriptive norm; controllability and self-efficacy) were directly assessed using the items developed for the TPB based questionnaire administered in phase two of this research. All questions were scored using a 7 point Likert scale and mean scores computed for each component. Higher scores reflected more favourable attitudes, higher levels of social pressure/descriptive behaviours by significant others and higher levels of perceived control and self-efficacy.

Menopausal symptoms

The Greene Climacteric Scale (Green, 1998) was drawn upon to measure menopausal symptoms in post-menopausal participants. This is a 21 items scale that provides information on the extent to which individuals are experiencing psychological, somatic and vasomotor menopausal symptoms. This questionnaire used a 4-point Likert scale

ranging from 0 = not at all to 4 = extremely. Questions 1-11 assessed psychological symptoms; anxiety was measured by summing items 1-6 and depression was measured by summing items 7-11. Somatic symptoms were assessed by items 12-18 and vasomotor symptoms by items 19-20, the respective items were summed to measure the extent participants experienced these symptoms. Item 21 is a probe for sexual dysfunction. The total Green climacteric score is the sum of all 21 scores with higher scores indicating more symptoms (Daiss, Wayment & Blackledge, 2013). This scale has been shown to be reliable and valid and has been used in studies comprising of post-menopausal women (Barentsen, van de Weijer, van Gend & Foekema, 2001; Green, 1998).

5.2.1.6. Procedure

Women interested in taking part were asked to complete an initial consent form and screening questionnaire. From this, participants were excluded if they indicated a health condition or were considered as meeting recommended levels of MPA and MSA. Individuals meeting the inclusion criteria were categorised based on menopausal status and invited to attend a session with the researcher at Ulster University to collect baseline data on the outcome variables. Participants were provided with an RT3 monitor to measure their aerobic PA and a PA diary to record their MSA over the next seven days. The PA monitor and diary were returned at the first consultation session which all participants attended in person. During this session, participants were provided with an opaque envelope containing the group they were allocated to.

Control group

Individuals allocated to the control group received standard information on the recommended levels of PA (DoH, 2011), information on the menopause and provided with feedback on their levels of MPA and MSA. These women received no further information but completed the same outcome variables as the intervention group five weeks after they were allocated to the control group.

Intervention group

Participants allocated to the intervention group received four individual consultation sessions and one PA class. All consultation sessions were conducted by the researcher and lasted approximately one hour. The PA class was facilitated by a trained instructor and performed at Ulster University. Participants meeting the inclusion criteria for this study were either pre- or post-menopause. Consequently, the weekly sessions were delivered face to face at Ulster University.

The intervention commenced once group allocation was known and undertaken over four consecutive weeks. An intervention guide was developed based on the BCTs presented in Table 5.1 and used during all sessions to help standardise the delivery of the intervention (see Appendix 3 for the full intervention guide). Once the intervention was finished, participants completed the outcome measures again and recorded their aerobic PA and MSA using an RT3 PA monitor and PA diary.

After seven days, the monitor and diary were returned to the researcher at Ulster University. Participants were asked if they would be willing to take part in an interview to evaluate the intervention. Interviews took place at Ulster University when

participants returned their PA monitor and diary. All interviews were audio recorded and transcribed verbatim.

5.2.1.7. Data analyses

Descriptive statistics were undertaken to explore participant characteristics and independent T-Tests performed on: BMI; affective and instrumental attitudes; injunctive and descriptive norms; controllability and self-efficacy; intention; average minutes of MPA and VPA to explore differences between treatments groups (i.e. control and intervention) which was used as baseline data. At the end of the intervention, differences between groups and across time was investigated using 2 (group: control vs intervention) x 2 (baseline and post-intervention follow up) mixed repeated measures ANOVA. Menopausal symptoms in post-menopausal women were explored using The Wilcoxon Signed Rank Test. Prior to undertaking the analyses the data were checked for normality by examining skewness and kurtosis. $P<0.05$ was considered as significant when interpreting the findings.

5.2.2. Stage two: qualitative evaluation

5.2.2.1. Participants

On completion of the intervention, women allocated to the intervention group were invited to take part in a post-intervention interview. Therefore, participants were women aged 30-64yrs and a sample of 10 was proposed for this stage of the study.

The proposed sample is based on the number of participants who completed the intervention.

5.2.2.2 Measures

Interviews

The interviews were guided by an interview schedule and employed a semi structured approach. The schedule is presented in Table 5.2 and provides an overview of the questions used to explore participant's views on the acceptability of the intervention.

5.2.2.3 Data analyses

Thematic analysis was used to analyse the data. This method is commonly used within qualitative research to identify, analyse and report themes (Braun & Clark, 2006). In line with this approach the transcripts were read several times to ensure familiarity with the information and initial observations noted in line with the aims of the project. Patterns in the data were identified and broad codes established and then refined. From this, the main themes were established. All codes and relevant extracted data were assigned to the main themes. The analysis process continued until the written report was complete to ensure no new themes emerged from the data. Throughout the study an iterative process was also used where themes arising in one interview were explored further in later interviews.

Table 5.2

Interview schedule used to explore the feasibility and acceptability of the intervention

Interview schedule
• Have you ever participated in a physical activity programme before?
• Did you enjoy taking part in the programme?
• Do you feel that the programme helped you to be more active?
• Did you find the weekly activities easy or difficult to complete?
• Were you satisfied with the content covered during the weekly sessions?
• What part of the programme helped you the most to improve your physical activity?
• Did this differ between intensity and strengthening activities?
• How did you feel about completing the weekly activity diary?
• Did the information on the psychological benefits; identifying rewards; and monitoring how you felt before and after your activities help you to improve your activity levels?
• Did you feel that planning including your weekly goals and discussing the problems helped you to improve your physical activity?
• Did you find it helpful to identify a family member, friend or work colleague who you viewed as physically active and completing one or more of your weekly goals with this person.
• How did you feel about taking part in group sessions?
• Do you think the number of sessions was too much, too little or the right amount to help you increase your activity levels?
• Besides the weekly sessions was there anything else that helped you to engage in more physical activity?
• Did you experience any challenges that made it difficult for you to be active?
• Was there anything that helped you overcome these?

Note. Table 5.2 presents the interview questions used during the evaluation. These were developed to reflect recommendations by the MRC for process evaluations. It should be noted that probe questions such as “can you explain why” and “can you tell me why you think...” were used.

5.2.2.4 Ethical considerations

Ethical approval for this study was provided by the School of Psychology Staff and Post-Graduate Research Filter Committee. Written consent was obtained from all participants and as such IDs were used when handling data to protect participant's anonymity. A code book was developed to ensure participants continued to use the correct ID. Participants were informed that they could withdraw by quoting their ID. The code book remained separate from the data. The data were handled confidentially and stored in a locked room at Ulster University where it will remain for a period of 10 years after completion of this thesis.

Given the nature of this research, a number of potential risks were identified. These were outlined in the ethical application and precautions put in place to minimise these. For example to reduce health risks, the activity class was conducted by a qualified instructor at Ulster University Sports Centre Coleraine where a trained first aider (including use of an Automated External Defibrillator AED) was also present. In order to reduce the risk of over exertion, participants set their own weekly goals. Participants were continually encouraged to develop achievable goals and informed to contact the researcher if they were experiencing any problems or were concerned about the impact on their health. Participants were asked to stop activities immediately if they experienced any health concerns and advised to contact their GP for further advice.

5.3. Results

The results were analysed with a view to determining participant characteristics and the feasibility and acceptability of the intervention. Participant characteristics and outcome variables for pre- and post-intervention are presented in stage one to explore differences between treatment groups (i.e. control and intervention). Stage two presents information on participant's views and opinions relating to the intervention components.

5.3.1. Stage one

5.3.1.1. Participant characteristics and attendance

Figure 5.1 presents a participant flow chart from enrolment to the participant interviews. Based on the criteria set out in section 5.2.1.1, none of the 23 women who enrolled in the intervention were peri-menopausal. Given this, a power calculation based on two groups was computed and as such a sample size of 16 was deemed acceptable for this study. After applying the exclusion criteria, a total of 18 women were eligible to participate. One participant withdrew. Therefore, in total, 17 women completed this study (M_{age}=44yrs, SD=10.48), nine pre- (M_{age}=35yrs, SD=3.37) and eight post-menopausal (M_{age}=54, SD=4.09). Of the 17 women who completed the study, seven were allocated to the control and 10 to the intervention group.

Table 5.3 presents participant characteristics by treatment group (i.e. control & intervention groups). There were more pre-menopausal women within the intervention group than the control group. However, the majority of participants in

both groups were married and were university educated. In total, 80% of those allocated to the intervention group attended all consultation sessions, while 60% of participants attended the consultation sessions and the demonstration class.

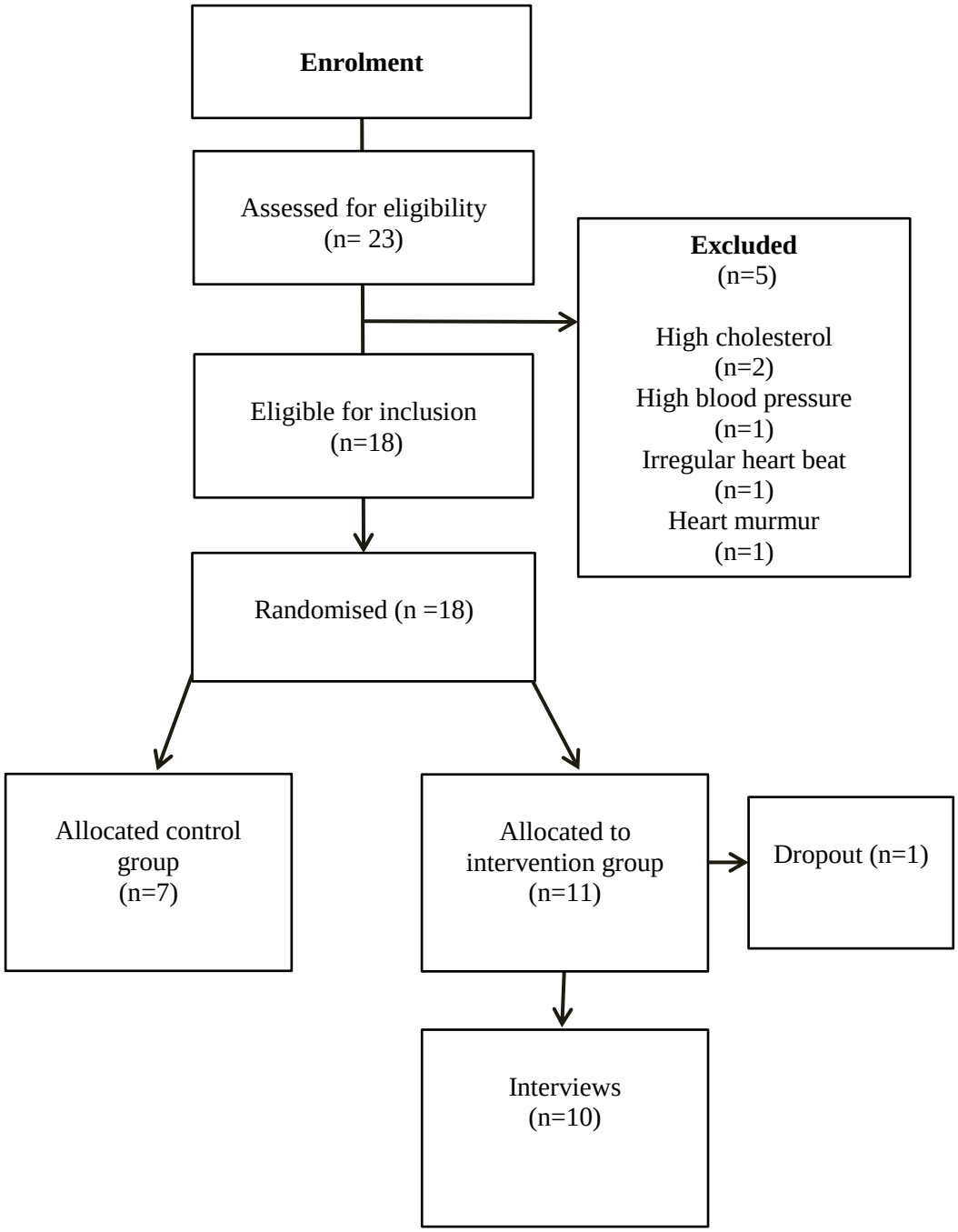
Table 5.3

Participant characteristics by group

Demographic information	**Control group n=7**	**Intervention group n =10**
Age (M)	45 (SD=11.32)	43 (SD=10.42)
Menopausal status (%)		
Pre-menopause	43	60
Post-menopause	57	40
Marital status (%)		
Married	71	60
In a relationship	14	30
Single	14	0
Divorced	0	10
Level of education (%)		
Secondary	14	30
College	29	10
University	57	60

Note. Descriptive information on age, level of education and marital status were computed to identify participant characteristics. Age is presented as a mean (SD) while percentages are used to illustrate menopausal status, level of education and marital status by group. Abbreviations: M= mean, SD = standard deviation, % = percentage and; n=number.

Figure 5.1: *Participant flow chart illustrating progress from enrolment through to the randomised controlled trial and subsequent*



5.3.1.2. Exploring group differences at baseline

An independent sample T-Test was conducted with a view to comparing the study variables for both groups (i.e. control and intervention) before completing this study. There was no difference between groups on LPA, MPA and VPA minutes per day at baseline (all $p>0.05$; see Table 5.4). Furthermore, there were differences observed between groups in scores for MSA or the TPB components relation to MPA. However, there was a difference between the control and intervention group on instrumental attitudes towards undertaking recommended levels of MSA with the control group reporting a higher mean instrumental attitude score compared to the mean score for the intervention group ($p = 0.02$; see Table 5.4). No further differences between the control and intervention groups on TPB relating to MSA were found.

Table 5.4

Mean scores and standard deviations for intervention and control groups at baseline

Variable	Control	Intervention	t	DF	P
LPA	86.71 (45.81)	91.55 (36.00)	.0.23	14	0.81
MPA	14.14 (12.06)	17.00 (12.25)	.465	14	0.64
VPA	4.57 (5.68)	4.33 (5.52)	.072	14	0.94
MSA	2.57 (6.80)	0.00 (.00)	1.0	6	0.35
TPB variables for MPA					
Affective attitude	6.24 (.65)	5.60 (1.37)	1.13	15	0.27
Instrumental attitude	6.76 (.41)	6.80 (.32)	.213	15	0.83
Descriptive norm	3.67 (.63)	4.17 (1.09)	1.06	15	0.30
Injunctive norm	6.19 (.63)	6.37 (.711)	.525	15	0.60
Self-efficacy	6.38 (.65)	6.07 (.69)	.938	15	0.36
Controllability	6.67 (.50)	6.40 (.66)	.893	15	0.38
Intention	6.10 (.60)	5.77 (1.49)	.548	15	0.59
TPB variables for MSA					
Affective attitude	5.52 (1.37)	4.83 (1.39)	1.00	15	0.32
Instrumental attitude	**6.86 (.17)**	**6.40 (.51)**	**2.58**	**11.8**	**0.02**
Descriptive norm	3.33 (1.18)	3.27 (1.20)	.113	15	0.91
Injunctive norm	5.38 (1.00)	5.63 (1.02)	.503	15	0.62
Self-efficacy	6.62 (.52)	6.13 (.89)	1.28	15	0.21
Controllability	6.71 (.48)	6.33 (.73)	1.28	14.9	0.21
Intention	6.00 (1.18)	5.27 (1.21)	1.21	15	0.24

Note. Means (SD) for the control and intervention groups were compared pre- intervention using an independent T-Tests. Homogeneity of variance was explored prior to reporting the findings. As level of MSA and instrumental attitudes and controllability towards undertaking weekly recommended levels of MSA violated this assumption equal variance was not assumed. PA scores are presented as average minutes per day. Wear time across groups at baseline was good with100% of control participants (n=7) complying with minimum wear time and 90% of intervention group (n=10). Significant results are presented in bold and abbreviations are as follows: LPA = light physical activity; MPA = moderate physical activity; MSA = muscle strengthening activities.

5.3.1.3 Intervention effects on outcome variables

Mixed between-within subjects ANOVAs were used to assess group differences in TPB variables and levels of PA, at two time points (i.e. pre- and post-intervention). Table 5.5 and Table 5.6 presents the mean scores and standard deviations for all the TPB variables at baseline and post-intervention for MPA and MSA respectively. This section begins by presenting the intervention effects on the TPB components targeted in the intervention design (i.e. affective attitudes; descriptive norms [MPA only], self-efficacy and intention) followed by the intervention effects on the remaining TPB components, levels of PA and the extent to which post-menopausal women experience menopausal symptoms.

Table 5.5

Pre- and post-intervention mean scores and standard deviations for intervention and control groups on TPB variables for MPA

	Control (n=7)		**Intervention (n=10)**				
TPB variables	**Baseline** Mean (SD)	**Follow up** Mean (SD)	**Baseline** Mean (SD)	**Follow up** Mean (SD)	**Time**	**Group**	**Time x group interaction**
Affective attitude	6.24 (.65)	5.76 (1.04)	5.60 (1.37)	6.43 (.72)	$F_{1, 15} = .580$, p=0.45	$F_{1, 15} = .001$, p=0.97	**$F_{1, 15} = 7.80$, p=0.01**
Instrumental attitude	6.76 (.41)	6.90 (.16)	6.80 (.32)	6.93 (.14)	$F_{1, 15} = 1.91$, p=0.18	$F_{1, 15} = .126$, p=0.96	$F_{1, 15} = .002$, p=0.96
Descriptive norm	3.67 (.69)	3.57 (.71)	4.17 (1.09)	4.43 (1.06)	$F_{1, 15} = .183$, p=0.67	$F_{1, 15} = 2.61$, p=0.12	$F_{1, 15} = .818$, p=0.38
Injunctive norm	6.19 (.63)	6.00 (.77)	6.37 (.71)	6.70 (.42)	$F_{1, 15} = .139$, p=0.71	$F_{1, 15} = 1.86$, p=0.09	$F_{1, 15} = 3.108$, p=0.19
Self-efficacy	6.38 (.63)	6.10 (.97)	6.07 (.69)	6.67 (.44)	$F_{1, 15} = .650$, p=0.43	$F_{1, 15} = .210$, p=0.65	**$F_{1, 15} = 5.163$, p=0.03**
Controllability	6.67 (.50)	6.57 (.41)	6.40 (.66)	6.63 (.42)	$F_{1, 15} = .268$, p=0.61	$F_{1, 15} = .207$, p=0.65	$F_{1, 15} = 1.51$, p=0.23
Intention	6.10 (.60)	6.10 (.87)	5.77 (1.46)	6.47 (.39)	$F_{1, 15} = .1.21$, p=0.28	$F_{1, 15} = .004$, p=0.95	$F_{1, 15} = 1.211$, p=0.28

Note. Values are mean (SD) scores for the control (n=7) and intervention groups (n=10) were compared at baseline and post-intervention using a series of mixed ANOVA. Scores are presented as means with the standard deviation presented in brackets. Table 5.5 also present the results for the main effects on time and group, and the time x group interactions. Significant results are highlighted in bold. Abbreviations are as follows: MPA = moderate physical activity; MSA = muscle strengthening activities.

Table 5.6

Pre- and post-intervention mean scores and standard deviations for intervention and control groups on TPB variables for MSA

	Control (n=7)		**Intervention (n=10)**				
TPB variables	**Baseline** Mean (SD)	**Follow up** Mean (SD)	**Baseline** Mean (SD)	**Follow up** Mean (SD)	**Time**	**Group**	**Time x group interaction**
Affective attitude	5.52 (1.37)	5.19 (1.38)	4.83 (1.39)	6.20 (.59)	$F_{1, 15} = 3.17$, p=0.09	$F_{1, 15} = 0.09$, p=0.76	**$F_{1, 15} = 8.59$, p=0.01**
Instrumental attitude	6.86 (.17)	6.81 (.26)	6.40 (.51)	6.80 (.28)	$F_{1, 15} = 3.07$, p=0.10	$F_{1, 15} = 2.72$, p=0.11	**$F_{1, 15} = 4.96$, p=0.04**
Descriptive norm	3.33 (1.18)	2.76 (.87)	3.27 (1.20)	3.90 (.93)	$F_{1, 15} = .017$, p=0.89	$F_{1, 15} = 1.32$, p=0.26	**$F_{1, 15} = 6.27$, p=0.02**
Injunctive norm	5.38 (1.0)	5.62 (.89)	5.63 (1.02)	6.23 (.73)	$F_{1, 15} = 2.28$, p=0.15	$F_{1, 15} = 1.47$, p=0.09	$F_{1, 15} = .426$, p=0.52
Self-efficacy	6.62 (.52)	6.43 (.68)	6.13 (.89)	6.80(.32)	$F_{1, 15} = 1.26$, p=0.27	$F_{1, 15} = .05$, p=0.81	$F_{1, 15} = 4.09$, p=0.61
Controllability	6.71 (.48)	6.71 (.40)	6.33 (.73)	6.70 (.35)	$F_{1, 15} = 1.22$, p=0.28	$F_{1, 15} = .98$, p=0.33	$F_{1, 15} = 1.22$, p=0.28
Intention	6.00 (1.18)	5.33 (1.46)	5.27 (1.24)	6.77 (.35)	$F_{1, 15} = 1.44$, p=0.24	$F_{1, 15} = .70$, p=0.41	**$F_{1, 15} = 9.79$, p=<0.001**

Note. Values are mean (SD) scores for the control (n=7) and intervention groups (n=10) were compared at baseline and post-intervention using a series of mixed ANOVA. Scores are presented as means with the standard deviation presented in brackets. Table 5.6 also present the results for the main effects on time and group, and the time x group interactions. Significant results are highlighted in bold. Abbreviations are as follows: MSA = muscle strengthening activities; SD = Standard deviation.

Affective attitude

There was no main effects for time or group on affective attitudes towards performing MPA. However, there was time by group interaction, indicating that a difference in affective attitudes towards undertaking MPA was present between groups, across time. Mean scores demonstrate that affective attitudes decreased within the control group while the intervention group demonstrated an increase.

Similarly, there was no significant main effect for time or group on affective attitudes towards performing MSA. However, a time by group interaction was identified indicating that a difference in affective attitudes towards undertaking MSA was present between groups, across time. It can be observed from the mean scores that the control groups scores decreased from baseline to post-intervention while mean scores for the intervention group increased.

Self-efficacy

There was no main effects for time or group on self-efficacy mean scores towards undertaking MPA. However, a time by group interaction was identified, indicating that a difference in self-efficacy was present between groups, pre – and post-intervention. Mean scores showed that the control groups self-efficacy score decreased while self-efficacy values increased in the intervention group.

There was no main effects for time or group on self-efficacy mean scores towards undertaking MSA. In addition, no interaction between time and group was observed. However, it can be observed that the mean value for the intervention group increased while the control group score remained the same.

Descriptive norm

The results indicate that there was no main effects for time or group. In addition, there was no significant time by group interaction on descriptive norms towards undertaking MPA. However, Table 5.5 indicates that a small but not significant increase in the mean value of descriptive norm between time point one and two in the intervention group while the mean score was beginning to decline in the control group.

There was no main effects for time or group on descriptive norms towards undertaking MSA. However, an interaction between time and group was observed, indicating that a difference in descriptive norm scores was present between groups, across time. The results presented in Table 5.6 show that the intervention group demonstrated an increase in mean scores for descriptive norm while the control group score for descriptive norm decreased.

Intention

There was no main effects for time or group on mean scores of intention towards undertaking MPA. In addition, there was no time by group interaction. However, an increase in the mean score for the intervention is observed while the mean value for the control group remained unchanged.

There was no main effects for time or group on intentions to undertake MSA. However, there was an interaction between time and group, indicating that a difference in intention to undertake MSA was present between groups, across time. The results presented in Table 5.6 show that mean scores for intention to undertake MSA decreased within the control group decreased while mean scores for the intervention group increased between baseline and follow up.

Instrumental attitude

There was no main effects for time, group or time by group interaction on instrumental attitudes towards performing MPA.

There was no main effect for time or group on instrumental attitudes towards undertaking MSA. However, a significant time by group interaction was observed, indicating that difference in instrumental attitudes was present between groups, across time, with the control groups mean scores decreasing and the intervention groups mean scores increasing between baseline and follow up.

Injunctive norm

There was no significant main effects for time, group or time by group interaction on injunctive norms towards undertaking MPA.

Similarly, there was no main effects for time, group or time and group interaction for injunctive norms towards undertaking MSA.

Controllability

There was no significant main effects for time or group on mean scores for control in relation to undertaking MPA. In addition, there was no time by group interaction.

Similarly, there was no significant main effects for time or group time on mean scores for control in relation to undertaking MSA. In addition, no interaction between time and group time was observed.

Level of PA

Mean METs in minutes/per day and standard deviations for LPA, MPA and VPA are presented in Table 5.7. The results indicated that there is no significant main effects for time or group on average LPA minutes per day. There was also no significant interaction between time and group.

There was no significant main effects for time or group on average MPA minutes per day and no significant interaction between time and group.

There were no significant main effects for time or group on average VPA minutes per day and no significant interaction between time and group.

Level of MSA

Mean MSA scores for the control group and intervention group at two time points (i.e. baseline & post-intervention) are presented in Table 5.6. The results indicated that there was a significant main effect for time indicating an increase in levels of MSA over the two time points across both groups. There was no significant main effect for group and there was no significant time by group interaction.

Table 5.7

LPA, MPA, VPA and MSA means scores and standard deviations at baseline and post-intervention for control and intervention groups

	Control (n=6)		**Intervention** (n=5)				
PA intensity	**Baseline** Mean (SD)	**Post** (Mean (SD)	**Baseline** Mean (SD)	**Post** Mean (SD)	**Time**	**Group**	**Time x group interaction**
LPA	87.0 (50.17)	88.8 (37.32)	87.2 (42.72)	65.8 (20.70)	$F_{1, 9} = 0.55$, p=0.47	$F_{1, 9} = 0.31$, p=0.58	$F_{1, 9} = 0.78$, p=0.39
MPA	13.0 (12.79)	11.3 (12.66)	15.4 (12.66)	16.4 (14.34)	$F_{1, 9} = 0.01$, p=0.89	$F_{1, 9} = 0.29$, p=0.59	$F_{1, 9} = 0.28$, p=0.60
VPA	4.8 (6.04)	4.3 (8.31)	7.4 (8.84)	3.2 (6.09)	$F_{1, 9} = 1.48$, p=0.25	$F_{1, 9} = 0.03$, p=0.86	$F_{1, 9} = 0.92$, p=0.36
MSA	2.5 (6.80)	6.5 (14.90)	0.0 (0.00)	17.0 (17.51)	$\boldsymbol{F_{1, 15} = 8.59, p=.01}$	$F_{1, 15} = .68$, p=0.42	$F_{1, 15} = 3.29$, p=0.09

Note. Values are mean (SD) for light, moderate and vigorous minutes per day for the control and intervention groups were compared at baseline and post-intervention using a series of mixed ANOVAs. Compliance with minimum wear time was lower post-intervention (control n=6; intervention n=5). Abbreviations are as follows: LPA = light physical activity; MPA = moderate physical activity; MSA = muscle strengthening activities and; post = post-intervention.

Menopausal symptoms

A Wilcoxon Signed Rank Test was conducted used to determine if there was a significant change in the extent to which post-menopausal women experience psychological (i.e. anxiety & depression), somatic and vasomotor menopausal symptoms after receiving the intervention. There was no significant difference in the extent to which post-menopausal women experienced anxiety z=-1.0, p=0.37 depression z=-1.34, p=0.18, somatic symptoms z=-1.0, p=0.31 and vasomotor symptoms z=-1.0, p=0.31 following participation in the intervention.

5.3.2 Results: Stage two

5.3.2.1. Participant characteristics

All participants (n=10) in the intervention group attended a post-intervention interview, namely, 6 pre- and 4 post-menopausal. Demographic information on age, marital status and level of education for the intervention group was previously presented in Table 5.2 and discussed in section 5.3.1.1.

5.3.2.2 Acceptability of the intervention

The qualitative data was analysed with a view to exploring the acceptability of the intervention. Consequently, women's views and opinions on the intervention were grouped under three main themes: satisfaction; general processes; and context. These themes are used to present the findings.

5.3.2.3 Satisfaction

Participants enrolled in the intervention for different reasons. For example, some women enrolled with a view to increasing their motivation to undertake recommended levels of PA and felt that the support they would receive as a participant would help them achieve this. Others wanted to lose weight or promote healthy ageing.

> "*I wanted something to motivate me, I thought if I did this it would give me something to work towards and maybe some guidance as well so that's probably the main reason*" (p72)

> "*I've always sort of thought I've be reasonably fit and I do things so I didn't really think that I needed to do anything extra, but then it's just when you get to a certain age where you need to do more*" (p292)

> "*Ideally to lose weight and get fitter*" (p291)

There was a general consensus that the intervention itself was straight forward and easy to understand. Thus, despite the number of BCTs used, most participants felt that the content covered was appropriate for increasing PA levels. Overall, it is clear that participants were motivated by the intervention.

> "*It was easy to understand and you didn't need gym membership or gear or anything, it was adaptable and appropriate*" (p616)

> "*It was quite straight forward*" (p1)

> "*I think it was really good and beneficial*" (p893)

"*It was good there were so many other benefits like you know just sort of getting out, getting fresh air, things that I wouldn't have done just because I couldn't be bothered*" (p72)

"*Yes, it has kinda gave me that bit more of a push , I got into a rut of thinking oh I don't have the time to do that and you see that you can and you can make a bit if time, doesn't need to be lot of time to go out and do things*" (p1)

In week one it was apparent that participants viewed aerobic PA more favourably than undertaking MSA. However, over the four weeks women's views towards MSA improved, particularly among pre-menopausal participants.

"*Surprisingly some of the muscle strengthening activities, I really like the actual feeling of the muscles working*" (p291)

"*The muscle strengthening activities I don't think, I think I didn't did one in the first week. So once I did that class that's when I realised I enjoyed it and it's something I would like to do*" (p72)

Post-menopausal women's views of undertaking MSA were more positive however, some still preferred aerobic PA.

"*Well I enjoyed the intensity activates most because you could hear, you know… I was conscious of the fact of what I was doing, you know my heart was beating faster, was getting warmer, I could talk but I was doing an aerobic type exercise, you know, and that's what I liked about that in that kind of way*." (p616)

The mode of delivery played a key role in whether or not participants were satisfied with the intervention. It was felt that being accountable for their MPA and MSA increased their motivation to undertake PA.

> "*I feel that when somebody has an expectation of me I like to fulfil that, definitely being responsible to carry out the activities for somebody else has been a motivator so I enjoyed kinda being part of something and the company, the encouragement and the learning involved*" (p786)

> "*It gave me that encouragement from when before when I was out walking all the time*" (p514)

> "*I think you needed that sort of weekly encouragement to sort of encourage you to meet your goals and to talk them through*" (p879)

5.3.2.4. General processes

The intervention components were categorised as: goal setting and planning; repetition and substitution; feedback and monitoring; shaping knowledge; comparison of the behaviour; rewards; natural consequences; associations and; social support. As such, these themes were used to shape the results presented below.

Goal setting and planning

Goal setting including reviewing behaviour goals, problem solving and action planning were viewed as acceptable and beneficial components of the intervention by most participants. Many of the women described how goal setting increased their

commitment and felt that discussing these goals encouraged them to maintain realistic and achievable goals. It was agreed that the goal setting process helped participants to focus on the level of PA they wanted to achieve and made it very clear how they were going to do this.

> "*Setting the goals was really useful, I think you were more likely to do something if you set a goal*" (p893)

> "*I think sometimes verbalising what you intend to do is quite good and having a discussion around things like that is quite good*" (p786)

Participant's progress was discussed each week and a joint decision made on whether or not goals should be modified for the forthcoming week. It was apparent that participants benefited from this process. As illustrated by the quotes below, reviewing behavioural goals provided social support and encouraged them to achieve their weekly MPA and MSA goals.

> "*What I liked the most was just like talking about goals, setting goals, feeling like, I felt like these things kind of helped me motivate myself I mean something that I wouldn't have sat down and done naturally really really helped me sort of become more clear about what I wanted to do*" (p72)

> "*It definitely did because again talking to you gave you that encouragement and then to prove to yourself, not only to you, that you could do it*" (p514)

> "*I would probably say, going through it with you the next week, explaining exactly what I did, and also identifying the problems and what you could do if this was to come up or to happen*" (p893)

The problem solving component was also viewed favourably. Participants appreciated the opportunity to discuss the issues that prevent them from undertaking MPA and MSA and enjoyed findings solutions that would enable them to achieve their goals.

> "*Some of the problems, they're so easy to work around, that you think that's just really an excuse, so I think then you were like right how can we solve this or what can we do. That really helped I think*" (p893)

> "*Yes it has kinda gave me that bit more of a push I kinda got into a rut of thinking oh I don't have the time to do that and you see that you can and you can make a bit if time, doesn't need to be lot of time to go out and do things*" (p1)

> "*You know if I had any problems or if something had come up I could, you know you had come up with suggestions or we had come up with a suggestion together to you know to get over the problem so I found it useful*" (p72)

The action planning component of the intervention was considered beneficial. However, it was clear that positive views towards action planning were linked with the other goal setting and planning components used in the intervention.

> "*Oh very much so, that was a big thing because it focused, I was focused on the plan for the week, and focused on the tasks that I needed to complete as I say that was part of the bargain*" (p184)

> "*I would have found excuses, well not excuses, maybe got to the day before and thought goodness I need to do x, y and z now, definitely having that planned out was beneficial*" (p786)

Repetition and substitution

While planning weekly goals, participants were encouraged to undertake these on the same day/time each week. The purpose of this was to formulate a behavioural habit. An "if-then" worksheet was used to aid this process. While participants did not explicitly mention this aspect of the intervention during the interviews this process may have contributed to the acceptability of the goal setting and planning component used in this research.

> "*Just planning it you know, just making it, you know you think you don't have time for it but you actually do, you surprise yourself, with the amount of time, you go out, you don't look at a watch*" (p616)

> *"Probably the planning of it and the problem solving of it cause there was days where or a week where I thought there was no way like I going to fit this in but we sat down and went through my diary and put it in and physically putting it in my diary made me think right I'm going to do this you know…I'm thinking automatically right its Tuesday, I have to do my exercises today*" (p897)

Monitoring and Feedback

Self-monitoring of behaviour and feedback were viewed favourably. Most women described how monitoring their PA helped them to see progress. Visually seeing progress in this way elicited a sense of achievement in some women and appeared to act as a motivator.

"*Keeping a log of what I was doing and making it accessible, you know, that kind of way… like the time came where I didn't need to be reminded with the reminder, you know if I didn't go out today, there was something missing of my day*." (p616)

"*I liked it actually you got to see what you were doing you know it was very sort of encouraging to see each day that you fulfilled what you were going to do and maybe more so that encouraged me to continue on*" (p72)

"*It's a good idea, it's something I wouldn't actually mind continuing to do because it keeps track of what you have and haven't done*" (p291)

"*It was just trying to think what days could we fit these in, and the diaries were really useful cause then I could look back*" (p893)

Although the majority of participants felt that monitoring their PA was an important component of the intervention, a few women felt that this was repetitive and had difficulty finding the time to complete the diary.

"*It was quite repetitive, you filled in the same activities each week and you weren't really doing the strengthening activities didn't really change that much, it would have, you felt you were just repeating yourself*" (p292)

"*I don't think it made that much of a difference because most times I was filling the diary the next day after or so after, a lot of the times I didn't fill it quite there and then*" (p1)

RT3 monitors were used to measure levels of PA with feedback based on this data provided during week one. Participants appeared to enjoy receiving this information as it highlighted how active or inactive they were while wearing the monitor.

> "*Whenever the monitor if that's what you call it, when I kept it on and was actually able to look at the feedback that you provided it was interesting to see*" (p184)

In some instances, participants were surprised that they hadn't undertaken higher levels of PA. Consequently, participant's discussed how this component of the intervention process reinforced the importance of intensity and increased women's knowledge of the recommended levels of PA.

> "*I think it was really helpful, I didn't know about you know if you weren't walking, that you had to walk a certain intensity for it to count, so that was really helpful"* (p893)

> "*I was doing exercise but didn't realise that I wasn't doing it at high enough intensity and also I wasn't doing any muscle strengthening exercises whatsoever so in both areas it's been really good"* (p879)

> "*I never even thought of that, the walking behaviours it was like, I thought I was getting enough exercise but I didn't realise that pace like made a difference so that was really good as well*" (p72)

Shaping knowledge

In week one instruction on how to perform the behaviours was provided. Participants talked positively about this information and particularly liked the leaflet on MSA.

Some participants felt that this information helped them to understand the importance of the intensity of their activities.

> "*I was doing exercise but didn't realise that I wasn't doing it at high enough intensity and also I wasn't doing any muscle strengthening exercises whatsoever so in both areas it's been really good*" (p879)

While the information provided in the MSA leaflet encouraged participants to try undertaking MSA.

> "*Oh no I found it helpful, you just went by the wee picture and told you what it wanted you to do and how often to do it to build it all up, it was concise, you know it wasn't like a video where you had to watch somebody, you just follow the instructions on the leaflet, yea and it was adaptable*" (p616)

> "*I actually don't hold any knowledge to do with, this was this was the first opportunity I kinda had to get some base knowledge in a very relaxed environment with no sense of judgement*" (p786)

Most reported using the leaflet. However, as time went on, some said they didn't need the leaflet anymore, particularly those who had attended the activity class.

> "*I referred to it the first couple of times and then I was able to do it myself*" (p893)

> "*Yeah, the information and guidance I used it quite a lot in the beginning to learn what exactly I should be doing and to remember what I should be doing obviously and then the class helped me with the form and stuff but I used it as a guide to begin with*" (p72)

Comparison of the behaviour and outcomes (pros and cons)

The demonstration class was incorporated within the intervention to enhance participants' knowledge of MSA. It was clear that those who attended this session found it really beneficial with some participants' identifying this aspect as the most enjoyable component of the intervention.

> "*I really enjoyed the work out with the girl that was excellent and for her to show us how to do them"* (p514)

> "*Also the exercise class was really good cause I wasn't sure about some of the exercises I was doing so it just gave me more confidence*" (p893)

When asked what they would like to change about the intervention most mentioned that they would have liked more sessions on MSA with a trained instructor.

> "*No not really but maybe if you had more classes you know maybe not that one-hour class but maybe a 15-minute session that you went to every week then you would have been sure that you were doing it right and maybe push yourself a wee bit more than what you do than when you're on your own*" (p292)

> *"Maybe if there was another session with her it might have encouraged me a wee bit more*" (p514)

The pros and cons of undertaking MPA were also discussed to reflect the main issues found to influence pre-, peri- and post-menopausal women's decision to perform this behaviour in phase one and two of this research process. While these were

discussed, participants did not mention whether or not this increased their own individual PA levels.

Rewards

Participants identified rewards (self-incentives) during the sessions and were asked to reward themselves once they had achieved their goals. Most women felt that this process was acceptable but that it didn't motivate them to achieve their goals. There was a general consensus that doing the activities elicited the reward they required to maintain these. This finding was linked to the psychological outcomes of undertaking PA and suggests that this component of the intervention was not beneficial.

> "*Not really because I suppose my rewards for exercising is endorphins, that feel good factor, when you go out there and you do that 3-mile trek that I do or I do that cycle ride, my reward for me personally is the buzz I get after doing it*" (p184)

> "*I didn't think that I needed the reward I just felt that I just needed to do the exercise rather than rewarding myself for doing it. I felt that it had to be done and I done it and I enjoyed doing it*". (p514)

> "*The reward, actually doing the exercises, it sounds quite sad but would be a reward for me because I'm achieving something that I might normally not do and so the reward system, doing the activity itself was enough for me*" (p786)

> "*Probably the one that didn't really help me that much was the reward, because I didn't really think about the reward or I forgot about the reward*" (p879)

Natural consequences

Participants were provided with a factsheet on the recommended levels of PA in week one which also contained information on the health consequences. Participants were also asked to monitor emotional consequences before and after achieving weekly goals using the PA affect scale. It was clear that these techniques were not well received by participants. Some women did mention that information on the health consequences encouraged them to undertake PA

> "*I found it useful but also knowing the fact that it was good for you gave you that wee thought in your mind that right now you have to go out and do it. The encouragement was there*" (p514)

However overall, participants felt that receiving health information did not help increase their PA levels.

> "*Well if I was honest with you no*" (p184)

> "*Not really, because I know whenever you get up and do something you always feel better and more energetic after you do it*" (p292)

> "*It was nothing new that I didn't already know so it was kinda just a matter of not being lazy and just going out and pushing myself more to do stuff so I wouldn't really say so because I say I kinda already have a good idea of the benefits*" (p1)

Although participants appeared to appreciate the emotional consequences of undertaking PA, it was clear that the method used to monitor this (namely the Physical

Activity Affect Scale) was not suitable. Overall, participants agreed that they didn't get benefit from this component of the intervention.

> "*You see I didn't really do that… I couldn't really feel much difference in my mood right away or whatever you know later down the road I might have been saying you know I really managed to do that today and you know feel pleased with yourself but to go through this here chart before, did I feel upbeat, did I feel calm….I sometimes don't take any of those into consideration*" (p879).

> "*I think everything was good apart from the physical activity affect thing, I really didn't…I found that you know, it's not very motivating to have to sit down and fill something in before and after your exercises and generally I didn't do it you know I would have filled it in after and it's like hard to gauge how you felt before because you were feeling different*" (p72)

Associations

Participants received one SMS prompt each week. Only a few participants explicitly mentioned this aspect of the intervention during the interviews. However, these women believed text messages were a good way of reminding people to achieve their personalised goals before returning to the next consultation session.

> "*You also sent the texts which I thought were very good cause that actually reminded me to do what I was supposed to be doing and not get kinda lost in other things*" (p184)

> "*It just made you think yes, don't forget to do it*" (p292)

> "*You get like the texts to kind of help motivate you*" (p72)

Social support

The majority of participants felt that identifying a friend, family members or work colleagues was not beneficial. Those who had adhered to this aspect of the intervention generally agreed that undertaking PA with these individuals restricted their progress.

> "*Not really, no….in the past I've had like exercise buddies and you know we have went all gung ho and we have done all the exercise and stuff and then whenever they stop I would stop because, just because it is an excuse not to do it you know it's cold outside you've ate a big dinner whereas like if I'm doing it myself then I can just put my trainers on and get out you know, I'm not waiting on anybody or texting anybody or talking to anybody about it*" (p72)

> "*It was, what would we say, nice to have the company but I also found it a bit restrictive, that I couldn't go to the pace I wanted to go*" (p1)

> "*No, they actually de-couraged, is de-couraged a word? Because they were sort of awh come on we will just go to lunch instead of actually going for the walk and then when we were walking we were walking quite slowly*" (p291)

One participant described how they needed to be self-motivated and not reliant on others.

> "*I needed to be motivated to go on my own because if I'm reliant on waiting on somebody to say oh yea I'm going or I'm not going, the likelihood is then if they aren't going I probably won't go so I need to be confident in going in myself and doing what I need to do*" (p879)

Thus, in the main, the practical social support element did not benefit participants. In contrast the social support and encouragement received as a participant in this intervention was viewed favourably. This process helped people to understand the tasks evolved and ensured that the intervention was tailored to suit the needs of those taking part.

> "*Probably whenever I said that a certain exercise didn't suit me there was an alternative, it wasn't a fact of oh no you can't do anything for this, there was a good alternative that I could actually do and I suppose when we've talked about scaling back on certain things and stages and stuff whereas before if you were doing it on your own, you'd be thinking aw I'll just give this up all together, or you go at it too hard or whatever, so the advice you got with it was really good*" (p879)

> "*I suppose I kinda felt you were the expert shall we say or you were there, you made it very clear you were there to support…. any question I asked you, you always had the answer and you always knew what I should do plus the fact you weren't saying to me you must do this*" (p184)

> "*The encouragement, yea, to talk it over and then the encouragement, for doing the muscle strengthening to initially to get to start doing them*" (p616)

Proposed changes

Although the practical social support element of the intervention was not considered beneficial, two participants suggested that group sessions or a buddying system might have motivated them to undertake more PA.

> "*Maybe the class you know a group class of everyone who is doing it could have attended every week, that maybe would have encouraged a bit more activity because you were maybe able to then make friends with the people who were in the group and organise sessions with them especially if you work within the same area*" (p291)

Another participant suggested that they would have liked the intervention to include more core exercises. In addition, it was felt that more classes with a trained instructor and an electronic system that allows participants to continue to monitor their PA levels would help maintain their PA levels.

> "*I think more core sort of exercise would be more something I'd be more interested in*" (p1)

> "*I suppose if some sort of programme developer like had an electronic system where you had to tag in or something like that, touch base to make sure your still doing something……I suppose it would be something to get you to focus on and keep going*" (p1)

As mentioned previously, some participants also suggested that more MSA sessions with a trained instructor would be beneficial.

5.3.2.5. Context

In order to explore the context of the intervention, participants were asked how they felt about attending the weekly sessions and the number of sessions they attended.

Some participants mentioned that meeting weekly for four weeks was inconvenient at times but acknowledged that these sessions were helpful.

> "*I was happy enough to sort of do them but it's like anything whenever you're trying to fit anything into your life it can be… not annoying that's the wrong word but sometimes it's a little bit of an inconvenience but like once I sat down made the plan out then you kind of knew were you were at and what you were doing, like it was good to have that*" (p72)

> "*I don't want to say dislike I don't want to say like but sometimes I go oh I nearly forgot……but no it was nice, it was fine enough once I took the time aside to do it*" (p1)

However, the majority of women were very clear that they were happy to meet weekly. Overall, participants felt that meeting once a week enhanced motivation and encouraged them to achieve their goals. Others suggested that meeting weekly made them feel accountable for their PA behaviour and provided direction.

> "*I think you needed that sort of weekly encouragement to sort of encourage you to meet your goals and to talk them through, I think if it was any less than that, you'd be sort of, you wouldn't be as committed to it as you were*" (p879)

> "*It just keeps you motivated and like I say, if I was having any problems with my exercises I could have said to you, I can't do that anymore, its killing me or whatever and you would have probably given me something else to do*" (p292)

> "*I really liked it, it's probably a bit sad but I really liked it and I felt that it was almost like bringing your homework into your teacher, you know like you've*

done what you said you were going to do, no I really liked it being weekly, it's definitely a motivator having it that frequent"(p786)

The length of the intervention was well received and it was clear that women were happy to participate in five sessions over the four weeks.

"*Just the right amount…….just what we covered in the time was just what we need to cover, it wasn't rushed*" (p616)

"*Just the right amount to help me. Definitely I think that any more you would be having to you know cut into your exercise time*" (p72)

Some women indicated that the length of the intervention was enough to get them to start partaking in PA. However, a longer intervention may have helped increase and maintain PA levels.

"*I do feel that maybe carrying on the intervention a bit longer you know instead of a month or however long it's been, maybe three months whereby you're maybe not seeing them every week but maybe every other week and that carries on and maybe more of an introduction to a buddying system in month two where you're introducing somebody to another person that's involved in the study and then maybe that's where the weekly sessions can then continue with you and somebody else and you're maintaining that diary throughout. I just feel that if it was a bit longer I feel that it would be a lifestyle change for me*" (p786)

"*I think probably just the right amount, it started off well, I suppose maybe a few more would keep you going in the habit for a bit longer but I think four weeks was a good start*" (p893)

Although, careful consideration should be given to how a longer intervention would be implemented as the commitment required was often seen as a barrier.

> "*I would probably say just the right amount, because it got me up and going and doing*" (p1)

> "*I think you can over bombard people with sessions and then maybe leave them to their own devices and if you left me to my own devices without meeting you I'd be like awh I will do it tomorrow…*" (p514)

5.4. Discussion

To my knowledge this was the first study that has designed, implemented and evaluated the feasibility and acceptability of a TPB-based intervention to promote pre, peri- and post-menopausal women's participation in recommended levels of MPA and MSA. The primary aim of this study was to explore the feasibility and acceptability of this intervention, with a view to refining the intervention and subsequently improving its effectiveness in these target groups. In keeping with this aim, the results indicate that the feasibility and acceptability of the intervention could be improved by refining the recruitment strategies and removing or altering the reward, monitoring of emotional consequences and practical social support elements of the intervention. Furthermore, participants suggested that they would like the intervention to include more PA classes, core exercises and a buddying system. Despite this, the intervention is promising, which is of particular importance given that undertaking at least 150 minutes of MPA with additional MSA activities on at least two days each week can reduce the risk factor of many NCD (DoH, 2011; Wen et al. 2011) and, encourages active ageing in women.

Given that the TPB informed the intervention design, the components of the intervention were included to target the key determinants of MPA and MSA (i.e. affective attitudes; self-efficacy; descriptive norms [MPA only] and intention). As a result of the intervention, women reported a statistically significant increase in affective attitudes and self-efficacy towards undertaking MPA. The intervention also increased pre- and post-menopausal women's affective attitudes and intention towards undertaking MSA. However, perhaps surprisingly, the intervention did not significantly increase women's intention to undertake MPA. These findings are

important, given that the intervention was developed based on the assumption that the TPB variables influence intention and that intention predicts behaviour. Previous research consistently supports the assumptions of the TPB with a plethora of research linking the theory constructs with intention (Boudreau & Godin, 2007; Ghahremani, Niknami & Nazari, 2012; Vallance et al. 2011) and intention with behaviour (McEachan et al. 2011; Stolte, Hopman-Rock, Aartsen, van Tiburg & Chorus, 2016).

There is a growing body of literature to suggest that affective attitudes significantly influence intentions and behaviour (Conner et al. 2015; Conner et al. 2011; Dunton & Vaughan, 2008; Morris, Lawton, McEachan, Hurling & Conner, 2016). Consequently, in recent years it has been argued that affective attitudes are more likely to impact PA behaviour than instrumental attitudes. The current study aimed to increase this construct as it was previously shown to predict pre-, peri- and post-menopausal women's intention to undertake MPA and MSA (Chapter four). Given this, it is encouraging that a significant increase in affective attitudes was evident. Thus, it is now known that pre- and post-menopausal women's affective attitudes towards undertaking MPA and MSA can be improved by participating in this intervention.

Previous research has also identified self-efficacy as a distinct predictor of intention to undertake PA (Aparicio-Ting et al. 2015; Parkinson, David & Rundle-Thiele, 2017; Vallance et al. 2011). For example, Parkinson et al. (2017) investigated the role of self-efficacy in predicting PA and eating healthily, comparing this component with the role of PBC. The results showed that self-efficacy and PBC are two different constructs and that self-efficacy is a better predictor of these behaviours. Consistent with this, the preliminary research presented in Chapter four identified self-efficacy as a predictor of intention to undertake MPA and MSA. Thus, the intervention was

designed with a view to increasing women's sense of self-efficacy. This was achieved as pre- and post-menopausal women identified a higher level of self-efficacy following the intervention. Therefore, the intervention components in this intervention can increase this concept in NI women.

In relation to MPA, whilst it was hoped that mean scores for descriptive norm could be increased, this did not occur. Practical social support was included in the intervention with a view to increasing descriptive norms, suggesting that this component did not work well. Furthermore, practical social support was not viewed favourably and as such may account for this finding. In light of this, it is imperative that alternative techniques for increasing descriptive norm are included and evaluated in future interventions.

Although it was not intended, it would seem that the intervention significantly increased pre- and post-menopausal women's instrumental attitudes and descriptive norms towards undertaking MSA. However, one possible explanation for this finding could be the difference observed at baseline between the control and intervention groups in relation to instrumental attitudes. Alternatively, the intervention components may have indirectly influenced instrumental attitudes by discussing the benefits of undertaking MSA, in turn, increasing participant's knowledge of activities. Nevertheless, as a significant increase in MSA occurred across time, it would seem that the mechanisms included in the intervention had a positive impact on this behaviour. This finding is of particular importance as MSA aids the preservation of skeletal muscle mass, strength, physical function and can improve bone mineralisation (Chodzko-Zajko et al. 2009; Cullinen & Caldwell, 1998; Howe, Rochester, Neil, Skelton & Ballinger, 2011).

The results indicated that there was no significant difference across time or between groups on MPA levels following the intervention. However, compliance with minimum wear time was lower post-intervention with only 50 % of those in the intervention group included in this analysis. It is possible that a larger increase in MPA mean minutes per day could have been achieved if compliance with minimum wear time was higher or reduced. While accelerometers are commonly used to measure PA (Berkemeyer et al. 2016; Wijndaele et al. 2015), the current study used a monitor worn at the waist. Thus, given that more wearable technology is available, issues surrounding wear time may also be reduced by using an accelerometer worn at the wrist and one that provides feedback.

As this research was an initial evaluation of the intervention, the primary aim was to explore its feasibility and acceptability with a small sample of the target populations. However, outcome variables were assessed and discussed to identify potential trends and any issues with implementing the research procedures (including measuring outcome variables). From this, compliance with minimum wear time was identified as a problem. Therefore, when conducting a larger scaled study it may be necessary to reduce the minimum wear time applied to the PA data during the analyses. Moreover, participants were encouraged to perform minimum recommended levels of PA (i.e. at least moderate intensity activity in bouts of 10 minutes) yet, mean minutes per day was used as the outcome for PA. Thus, when further evaluating the intervention, the outcome variable for PA should be amended to more accurately reflect whether or not participants are meeting recommended levels.

Research has shown intervention techniques such as: goal setting; action planning; problem solving; self-monitoring; social support; instructions on how to perform the

behaviour; consequences of the behaviour and rewards to increase PA levels in diverse populations (Adams et al. 2017; Allen, Whittemore & Melkus, 2011; Michie, Abraham, Whittington, McAteer & Gupta, 2009; de Vries, Kooiman, van Ittersum, van Brussel & de Groot, 2016). However, selecting the most acceptable combination of intervention techniques is critical to attain and sustain behaviour change. Given that PA is not increasing as expected (Sallis et al. 2016), it would suggest that the majority of PA interventions are yet to devise a series of techniques that attain and sustain behaviour change within specific target populations. The reason for this is relatively unknown, but it is argued that the acceptability of the intervention and components to participants is rarely explored (Ayala & Elder, 2011).

In recent years guidance for developing and evaluating complex interventions has placed more emphasis on identifying the acceptability of the intervention and intervention components within target groups. Given this, the number of acceptability studies has grown significantly in recent years (Currie, Gray, Shepherd & McInnes, 2016; McMahon et al. 2016; Moitra, Gaudiano, Davis & Ben-Zeev, 2017; Murphy, Cupples, Percy, Halliday & Stewart, 2008; Webster et al. 2017). For example, Currie, Gray, Shephard and McInnes (2016) conducted a qualitative study exploring women's experiences and acceptability of antenatal walking groups. The results indicated that these women like to undertake PA that makes them feel better, that are enjoyed and helps them to relax. The social aspect was deemed acceptable by some but not all. However, there was a general consensus that the facilitators' personality was more important than their professional background, suggesting that interventions for women during pregnancy may be more acceptable if barriers in relation to social anxieties are reduced and the facilitator is someone they know.

The present study found that pre- and post-menopausal women considered the TPB based intervention to be straightforward and easy to use, thus, suggesting that the intervention components were acceptable to these women. In line with Currie, Gray, Shephard and McInnes (2016), the interpersonal skills of the facilitator were important and ultimately played a key role in influencing the overall acceptability of the intervention components. In general, the results suggest that: goal setting; problem solving; action planning; reviewing behavioural progress; feedback; self-monitoring; demonstration and modelling of behaviour; information on how to perform the behaviour; prompts; pros and cons and; nonspecific practical support were acceptable to pre- and post-menopausal women. Feedback, problem solving, goal setting and self-monitoring were seen as the most beneficial, suggesting that these components are fundamental to the success of an intervention for pre- and post-menopausal women.

While the findings are encouraging, some factors were not viewed favourably. For example, it was clear that pre- and post-menopausal women did not find the rewards, monitoring of emotional consequences and practical social support elements of the intervention beneficial. Thus, suggesting that these components could be removed. However, this study used self-incentives and asked participants to reward themselves when they achieved a specific goal. Given that previous research suggests immediate financial incentives help increase PA levels (Adams et al. 2017), it is possible that the method used to reward participants in this study was not the most suitable form of reward. Thus, including immediate financial incentives could improve the acceptability of the intervention and increase activity levels. It was also clear that monitoring of emotional consequences was the least favoured intervention component and should be removed. The findings indicated that pre- and post-menopausal women were aware of the emotional consequences of PA and were motivated by experiencing

these rather than reflecting or monitoring differences. Thus, the practical social support element should be removed. As this component was included to increase descriptive norms, there is a need to incorporate an alternative method to increase mean scores for descriptive norms. Given that, descriptive messages have yielded some success in the past (Crozier & Spink, 2017), including descriptive messages may help to increase women's descriptive norms and subsequent levels of MPA. However, future research should explore the acceptability of this component to determine its appropriateness.

Participants reported that additional MSA classes and information on how to perform core exercises would be beneficial. As such, prior to implementing a larger scaled study, more demonstration classes should be included in the intervention. This in turn, could also increase women's knowledge of core exercises. However, to ensure the acceptability of the intervention is improved, the MSA leaflet should be enhanced to include a wider variety of exercises and difficulty levels. Some women mentioned that including a buddying system would improve the intervention. While this may help, the research presented in Chapter three suggests that some women prefer to PA on their own. Other feasibility and acceptability studies have also found mixed views in relation to undertaking PA with others (Currie, Gray, Shephard & McInnes, 2016). Therefore, it is recommended that in future, initial assessments are carried out to determine women's preference and those who indicate that they would like to take part in a buddying system could be paired up while others can undertake PA on their own. However, it is possible that some participants who may benefit from a buddying system will not avail of this, given that factors such as self-esteem and confidence levels could influence this decision. Therefore, it would be important to provide an

opportunity for participants to avail of this support throughout the intervention and not only on entry to the programme.

This study had difficultly recruiting peri-menopausal women to the intervention. There are a number of possible explanations for this: (1) the intervention may not have met their specific needs; (2) peri-menopause can be a challenging time for women and increasing PA is not a priority and; (3) the recruitment strategies did not reach a large enough sample of women. To increase the likelihood of attracting peri-menopausal women, the reach of this intervention would need to be increased. If increasing the reach of this intervention does not encourage peri-menopausal women to participate, further research should be undertaken to ensure that the intervention meets the needs of peri-menopausal women. Alternatively, running an intervention such as the one delivered in the present study within a primary care facility (e.g. GP surgery) could potentially increase recruitment and reach of the target populations. However, careful consideration needs to be given to the mode of delivery and length of the intervention to ensure that the intervention runs long enough to influence change without becoming a burden on women's time. A longer intervention using a blended approach may address this.

Furthermore, future research should consider exploring women's views on how symptoms associated with the menopause negatively or positively influences their MPA and MSA levels, and whether or not the menopause could be used to motivate people to maintain their PA during midlife and later adulthood.

5.4.1. Limitations

This study has a number of limitations which may have influenced the findings. Firstly, the study sample was well educated and by enrolling in an intervention demonstrated that they were motivated to change their PA levels. Therefore the results many not be fully representative of the target population. It would be beneficial for future research to recruit a more representative group of women. Excluding participants based on minimum wear time was a further limitation of this study. This approach considerably reduced the number of participants who were eligible for inclusion when analysing PA levels.

After conducing this research, randomising participant during this initial evaluation could be considered as a limitation. The aim of this study was to explore the feasibility and acceptability of a TPB-based intervention, therefore, randomising women to a control group limited the number of participants who could comment on the intervention procedures. Given the need to promote retention, particularly in a larger scaled evaluation, future research should explore participant's willingness to be randomised and the acceptability of a waiting-list control group.

The researcher responsible for implementing the intervention also conducted the evaluation. Consequently, it is possible that participants provided social desirable responses. To minimise this, the researcher encouraged participants to discuss both the positive and negative aspects of the intervention. However, future research should be undertaken using a fully independent researcher with delivery and evaluation completed independently. The fidelity of the intervention was not explicitly explored in this study. Thus, all sessions with participants should be recorded and coded by an

independent research to identify the BCTs delivered and whether they were consistently delivered to each participant.

In addition, the current study did not explore how well the information on the menopause was received or whether or not knowing this increased women's knowledge of the menopause or motivated them to increase their MPA and MSA levels. Thus, further research adopting a life course approach to investigating women's knowledge of the menopause and the impact of this on PA is needed.

5.4.2. Conclusion

Theory-based interventions have been used in the past to increase women's PA levels. However, in general, PA levels are not increasing as expected from the implementation of such intervention. The mixed methods used in this study allowed for the feasibility and acceptability of a TPB-based intervention to promote pre- and post-menopausal women's participation in minimum recommended levels of MPA and MSA in NI to be investigated. The findings suggest that the intervention is feasible and acceptable to pre- and post-menopausal women as evidenced by low attrition, good attendance as well as the increasing trends on the theoretical constructs and positive opinions in relation to the intervention components. Despite this, the results from the present study highlighted a series of factors that should be addressed to improve the potential effectiveness of the intervention.

5.5. References

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Chapter 6

General discussion

6.0. Introduction

This is the final chapter in this thesis and aims to summarise the main findings of the research presented within the three empirical research chapters (i.e. Chapter three, four and five). Thus, this chapter begins with an overview of the purpose of this work followed by a brief discussion on the main findings and what this research adds to the literature. This chapter concludes with an overview of the limitations, a general conclusion and recommendations.

6.1. Purpose of this work

As illustrated in Chapters one to five of this thesis, it is imperative that pre-, peri- and post-menopausal women are actively undertaking minimum recommended levels of MPA with additional MSA on at least two days, per week. Despite this, the proportion of women undertaking these levels of PA are low across the life course with women in NI amongst the lowest in the UK (BHF, 2015). Past strategies for increasing PA in NI and beyond have had limited effect, with few (if any) specifically focusing on the MSA aspect of the PA recommendations. Thus, further advancements are necessary to produce and sustain change. More specifically, the DoH (2014) suggested that a life course approach to the promotion of recommended levels of PA that target transitional phases known to impact health and health behaviours are needed to improve health (DoH, 2014). In recognition of this and the implications of the menopause (see Chapter two), the work included in this thesis aimed to develop an intervention to promote pre-, peri- and post-menopausal women's participation in recommended levels of MPA and MSA using the TPB. As discussed in Chapter two section 2.7, a mixed method multi phased research design involving three sequential phases of

research was required to achieve the aims of this thesis. Chapter three, four and five of this work presented and discussed each phase of the research process respectively. A final discussion on the main findings presented in Chapter three, four and five of this thesis is provided in section 6.2.

6.2. The main findings of this work

6.2.1. Chapter three: phase one

The research presented in Chapter three of this thesis was the first phase in the research process. To reiterate, this research was undertaken to explore pre-, peri- and post-menopausal women's attitudes and motivations towards undertaking minimum recommended levels of MPA and MSA each week, using the TPB. Six focus groups and nine interviews were undertaken with pre- (n=16), peri- (n=8) and post-menopausal women (n=11) to achieve the aims of this study. Information on participant characteristics and PA levels was also collected. The findings from this phase of the research process provided a better understanding of the cognitive processes that guided these women's attitudes and motivations towards undertaking MPA and MSA in the context of behavioural, normative and control beliefs. Furthermore, the results illustrated whether these beliefs differed based on menopausal status.

Overall, the findings highlighted that women held positive attitudes towards undertaking MPA but their attitudes towards undertaking MSA were less favourable. In relation to MPA, women's attitudes and motivation towards performing this behaviour was influenced by a series of behavioural, normative and control beliefs that

were reported across groups (e.g. physical and psychological health benefits; family members; motivation; time constraints). These findings are similar to previous studies that have used the TPB to explore attitudes and motivations towards undertaking PA in adults (Downs & Hausenblas, 2005; Belanger-Gravel et al. 2012). However, the results showed that a number of beliefs were prominent in one or more groups, depending on menopausal status (e.g. social interaction; accountability to others; weight control; health professionals; tiredness; green space; PA opportunities at work). Thus, to promote MPA in pre-, peri- and post-menopausal women it is imperative these differences are recognised in practice.

It is not surprising that issues found to influence women's decision to undertake MPA differed across menopausal phases as a previous research has demonstrated that some beliefs and the relative importance of these differ among diverse populations (Blue, Marrero & Black, 2008; Courneya & Friedenreich, 1999; Hamilton & White, 2010). It is possible that changes associated with the menopause contributed to the slight variation in behavioural, normative and control beliefs reported by pre-, peri- and post-menopausal women. However, changing relationships and work commitments may also explain differences across groups. Nevertheless, the results from phase one reinforce the view that researchers using the TPB to inform the design of an intervention should conduct extensive formative research with the specific populations they aim to target for intervention.

The findings in relation to MSA were more conflicting than those found to influence women's decision to undertake MPA. With regards to MSA, behavioural, normative and control beliefs such as: improved muscular health; psychological benefits; unenjoyable/boring; health professionals; family members; equipment; time

constraints; fear of judgement; knowledge and current capabilities were reported. However, it was apparent that these views were not well established within the study sample. Pre-, peri-, and post-menopausal women were unaware of the recommended levels of MSA and how to perform these in addition to MPA. Consequently, the results highlighted knowledge as the main issue that influenced these women's attitudes and motivation towards undertaking recommended levels of MSA. Due to limited theoretical research in this domain, it is difficult to place these findings in context. However, similarities between the findings outlined above and previous research identifying factors that influence strength training in women is evident (O'Dougherty et al. 2008; Nazaruk et al. 2016). For example, negative perceptions towards undertaking MSA and a lack of knowledge were reported in previous research and also found to influence MSA in the current study. Thus, suggesting that perceptions and knowledge of MSA may be a problem in a number of countries, in turn, impacting whether or not women undertake recommended levels.

The findings presented in Chapter three had important implications for the intervention design. Firstly, it was apparent that a series of beliefs that influenced pre-, peri- and post-menopausal women's attitudes and motivation to perform MPA, differed across groups. This finding indicated that the intervention should aim to target group specific attitudes and motivations towards undertaking MPA. In particular, the results suggested that providing information or discussing the psychological benefits of undertaking MPA with pre- and peri-menopausal women could motivate these women to undertake MPA. Positive deliberation could be enhanced by linking these benefits with parental responsibilities for pre-menopausal women and the psychological implications of the menopause among peri-menopausal women. For post-menopausal women it would seem that discussing the ageing health benefits or providing

information on the health benefits could promote recommended levels of MPA. However, whilst theoretically speaking, the results suggested that providing information on the ageing health benefits would promote positive deliberation, the findings as a whole suggested that these women needed to specifically relate their personal health needs with the health benefits of undertaking MPA. Thus, it is possible that this finding was a contextual issue that could be addressed by delivering or offering PA interventions through primary care facilities.

In the context of the TPB, the role of normative referents was not fully understood in the present study. It was apparent that significant others can encourage these women to undertake MPA but participants were unlikely to be motivated by social pressure. Nonetheless, family members were identified as a significant normative referent across groups. Consequently, it was concluded that social support or encouragement from others may increase pre-, peri- and post-menopausal women decision to undertake MPA. It is important to note that health professionals were identified as a significant normative referent among post-menopausal women. However overall, the results suggested that generic information on the health benefits from health professional was unlikely to motivate these women to undertake MPA. Based on the results, it would appear that health professionals have a more active role to play in motivating post-menopausal women to perform this behaviour (i.e. referrals to PA interventions; contacting clients who would benefit from participating in a PA intervention).

When designing the intervention the findings indicated that control beliefs should also be considered based on menopausal status. Although issues such as time constraints were reported across groups, time constraints were primarily impacted by parental responsibilities in pre-menopausal women and ageing parental responsibilities in peri-

and post-menopausal women. It also emerged that additional commitments and work also placed constraints on time. However, some women suggested that 'not having the time' to undertake MPA was an excuse, with pre- and peri-menopausal women viewing changes in their PA more favourably. Reflecting on the first phase of the research process, it would seem that peri-menopausal women felt that undertaking recommended levels of MPA was an additional burden. However, the results indicated that if they were to undertake this behaviour they preferred to do this alone. It was apparent that this finding was linked to the psychological benefits but also with time constraints, which were considered more challenging during this menopausal phase. Thus, when designing the intervention it was important to consider the control beliefs for each group with a view to minimising barriers to participation. Moreover, given that participating in an intervention would require a time commitment the findings suggested that to encourage participation, particularly in peri-menopausal women, careful consideration needed be given to the length of the intervention and the mode of delivery.

Although these findings provided valuable information on the cognitive processes that influence pre-, peri- and post-menopausal women's attitudes and motivation towards undertaking MPA, it should be acknowledge that women were unfamiliar with current recommendations of aerobic PA (i.e. at least 150 minutes of MPA). However, participants were able to draw upon their knowledge of past recommendations (i.e. 30 minutes, 5 times a week) and experiences of PA to discuss their views and opinions towards undertaking this behaviour. It could be argued that these recommendations reflect the same level of PA and as such this finding does not have additional implications for the intervention design. However, as recommended levels of PA were amended to offer more flexibility with the aim of increasing PA and improving

population health, it is imperative that these women are aware of this change. In light of this, it was concluded that knowledge of the current recommend levels of MPA should be promoted within the intervention.

With regards to MSA, it would seem that the behavioural, normative and control beliefs summarised above provided a better understanding of the issues influence pre-, peri- and post-menopausal women's. However, as acknowledged, these views were inconsistent and participants across groups found it difficult to discuss their view and opinions towards undertaking MSA. It was clear that pre-, peri- and post-menopausal participants were unaware of this aspect of the PA recommendations and how to perform MSA in addition to aerobic based PA. Consequently, a number of participants were unable to discuss this topic while others tried to provide responses to the focus group/interview questions but were unsure if these were correct. This finding had a direct impact on women's attitudes towards undertaking MSA and the reliability of the results presented in Chapter three of this thesis.

Nevertheless, it would appear that undertaking this research has highlighted an important issue that has public health implications. Given that rates of musculoskeletal conditions represent a major health burden, particularly for women following the menopause (Finkelstein et al. 2008; Van Dijk et al. 2015), it is concerning from a public health perspective that women were unaware of the recommended levels of MSA. Thus, in the context of this research, the findings suggested that pre-, peri- and post-menopausal women require information on the recommended levels of MSA and how to perform these in addition to the recommended level of MPA. Notably, at this point there was no evidence to suggest that an intervention to increase MSA among these women needed to differ based on menopausal status.

Undertaking this research presented a number of challenges. For example, it proved extremely difficult to recruit pre-, peri- and post-menopausal women to participate in this study. On reflection, it would seem that these women did not understand the terms used to describe the different menopausal phases and were hesitant about being identified as pre-, peri- or post-menopausal. As a result, it was possible that using these terms in the recruitment process contributed to this issue. Although I recognised at the time that women were reluctant to take part, this was my first experience of recruiting this target population and I initially thought the method of data collection (i.e. focus groups) was responsible for the recruitment issues I was experiencing. Consequently, it was decided that data from the focus groups would be triangulated with data collected using interviews. Making this amendment to the data collection procedure was useful, but recruitment remained slow.

As mentioned in section 3.2.1, operationally defining the research questions that guided the focus groups and interviews in line with TPB recommendations (Francis et al. 2004) may have impacted the findings. Although operationally defining the behaviours of interest to reflect the TACT principles is important within TPB-based research behavioural, normative and control beliefs are traditionally collected using open ended questionnaires. This approach does not provide the same opportunities for people to express their opinions, share their experiences or ask questions, which are available within an interview or focus group. Therefore specific questions are necessary. However, within a qualitative context, defining the questions in this way potentially restricted the depth of the data obtained. Given that focus groups and interviews are facilitated and are being used more frequently within TPB-based research, more qualitative approaches to designing research questions should be adopted.

6.2.1.1. What this study adds to the literature

Over the years the TPB has emerged as a popular framework for studying the cognitive processes that underlie people's decisions to undertake PA (e.g. Belanger-Gravel et al. 2012; Downs & Hauseblas, 2005; Hamilton & White, 2010). These studies typically focus on aerobic PA, with few (if any) specifically focusing on the cognitive determinants of MSA. The findings, particularly those related to MSA have the potential to address this gap in the literature and provide researchers, practitioners and policy makers with valuable information on the factors that influence women's participation in MSA. Moreover, the target behaviours were defined in the context of current recommendations to ensure that these were reflective of the level of PA required to produce health benefits. Past research has provided an insight into the cognitive processes that form people's attitudes and motivation to undertake PA, illustrating that these can differ in diverse populations and between behaviours. Consequently, when developing interventions it is imperative to understand the cognitive processes specific to the target populations and the behaviours under investigations. This information contributes to the development of tailored interventions that meet the target group's needs on multiple levels.

Although the TPB has been applied within the PA domain before, the research presented in Chapter three is the first study to explore the cognitive processes that influence pre-, peri- and post-menopausal women's attitudes and motivations towards undertaking minimum recommended levels of MPA and MSA using the TPB. Thus, the present findings specifically contributes to our understanding of the factors that influence women's decision to undertake MPA and MSA at three key transitional phases (i.e. pre-, peri- and post-menopause), using the TPB. Understanding these

issues is fundamental to the success of a TPB-based intervention for these women and can be used to inform practice. Furthermore, this research phase has highlighted an important public health issue (i.e. awareness of recommended levels of PA) that requires further research.

6.2.2. Chapter four: phase two

The second phase in the research process was presented and discussed in Chapter four of this thesis. This phase of research was undertaken to identify and explain the factors that contributed to pre-, peri- and post-menopausal women's intention to undertake minimum recommended levels of MPA and MSA, using a TPB-based questionnaire. Descriptive information on participant characteristics and the percentage of women achieving recommended levels of MPA and MSA was also collected. Menopausal status was determined using characteristics of menses and age. The sample comprised of 186 women, of those, 76 were pre-, 45 were peri- and 65 were post-menopausal. The findings from this phase of research provided information on the underlying beliefs that influenced pre-, peri- and post-menopausal women's intention to undertake MPA and explored differences between groups on all of the TPB variables for MPA and MSA. In addition, the components of the TPB that significantly contributed to the variance in intention to undertake MPA and MSA were also identified.

In line with PA trends in Northern Ireland (British Heart Foundation, 2015), the results showed that the majority of women who completed phase two of the research process were not meeting recommended levels of MPA and MSA. However, the current study found that the proportion of women undertaking recommended levels of MPA and MSA increased from pre- to post-menopause. This result is in contrast to the findings

of previous research reporting on the prevalence of these behaviours (Murtagh et al. 2015; Strain et al. 2016). Differences in the classification of groups between studies could contribute to this finding. Women's knowledge and experience of menopausal symptoms provides a further explanation for this finding. That is, peri- and post-menopausal women included in the current study may have been actively engaged in MPA and MSA to counteract the implications of the menopause.

In relation to the quantitative assessment of the TPB variables, a relationship between affective beliefs (for example: 'clears head'; feel better'; 'enjoyment') and intention was observed. However, differences across groups were apparent. Interestingly, normative beliefs (e.g. family; friends) were linked with women's intention to undertake MPA while doctors were also linked with post-menopausal women's intention to undertake this behaviour. Work and family commitments were associated with pre-menopausal women's intention whilst having a goal and cost were associated with peri-menopausal women's intention to undertake MPA. There were no associations between control beliefs and intention for post-menopausal women.

In addition, the results presented in Chapter four indicated that affective and instrumental attitudes; injunctive and descriptive norms and self-efficacy and controllability towards undertaking MPA and MSA did not differ across menopausal groups. However, self-efficacy, affective attitudes and descriptive norms were found to make a significant contribution to the variance in intention to undertake MPA in the study sample. In relation to undertaking MSA, self-efficacy and affective attitudes were highlighted as key factors that contributed to pre-, peri and post-menopausal women's intention to perform this behaviour. These findings provide additional support for the two component model of the TPB, suggesting that distinct components

play a key role in explaining women's intention to undertake MPA and MSA. Consequently, this study suggests that future PA-based research should include distinct components of the theory constructs and not retired the theory as suggest by Sniehotta, Presseau and Soares (2014).

In the present study, self-efficacy emerged as the strongest predictor of intention. This finding is in keeping with previous research conducted by Vallance et al (2011) with post-menopausal women and suggests that self-efficacy rather than controllability may result in PBC emerging as a significant predictor of PA intention in previous studies. This finding has important implications for the success of TPB-based interventions as placing more focus on controllability than self-efficacy when PBC is identified as a predictor of intention may limit behaviour change.

Given that affective and not instrumental attitude was associated with women's intention to undertake MPA and MSA, the results of this study reinforce the view that affective attitude is a stronger predictor of intention (Lowe, Eves & Carroll, 2002; Lawton, Conner & McEachan, 2009) and suggests greater levels of affective attitudes can increase MPA and MSA in women.

The finding that descriptive norm is associated with intention to undertake MPA provides some support for previous research that suggests this component may be an important factor in predicting PA (Priebe & Spink, 2011). However, caution should be taken when interpreting this finding as descriptive norm was the weakest of the three components found to influence intention and explained the lowest amount of variance in intention. In relation to MSA, descriptive norm did not make a significant contribution to the variance explained in intention; women's perspective and knowledge of MSA may have contributed to this finding. For example, women may

have considered muscle strengthening as an activity people do on their own or that others do not engage in.

The present findings had important implications for the intervention design. For example, since differences in the underlying beliefs that influenced women's intention were evident across groups, the behaviour related information provided to pre-, peri- and post-menopausal women as part of the intervention should reflect these findings. Thus, it was decided that this information would be discussed in the context of the pros and cons and that these would reflect differences across groups. Although it was concluded that the behaviour related information for MPA should be tailored based on menopausal status there was no further evidence to suggest these women required distinct interventions. In light of this, it was decided that the behaviour related information for MPA would be tailored to reflect group differences but that the intervention components would be selected to target the factors found to predict these women's intention to undertake MPA and MSA and administered to pre-, peri- and post-menopausal women. Consequently, in practice, an intervention should aim to change these women's perceptions of their own ability to perform MPA and MSA. Furthermore, the results indicated that interventions should aim to change how these women feel about performing minimum weekly recommended levels of MPA and MSA. Descriptive norm was associated with intention to perform MPA, this finding suggested that an intervention should incorporate opportunities for these women to see significant others undertaking MPA.

Identifying and explaining the factors that influenced pre-, peri- and post-menopausal women's intentions to undertake MPA and MSA was not as challenging as undertaking the research presented in Chapter three. I was expecting to experience similar

difficulties with regards to recruitment however in general; recruiting pre-, peri- and post-menopausal women to participate in this phase of the research process was less problematic. The methodology employed in this phase of research provides one possible explanation for the difference experienced between studies. In the first phase of the research process, potential participants met with the researcher and the study was discussed in person. The majority of women that participated in phase two of the research process completed an online questionnaire which allowed them to explore the aims of the research and complete the questionnaire anonymously thus, removing any personal identification of menopausal status. Alternatively, it is possible that women were more willing to participate in this phase of the research process as it was not as time consuming.

Although disseminating the questionnaire using an online platform was relatively successful, a paper version of the questionnaire was available. Thus, to supplement the online distribution of the questionnaire I tried to recruit women from community organisations. Again, this approach presented two problems, firstly the numbers of women attending these organisations were relatively low and secondly women appeared uncomfortable with agreeing to participate in front of their peers. However, as mentioned, the primary method of data collection (i.e. an online TPB-based questionnaire) was useful and reduced barriers to participation.

It is notable that when the questionnaires were completed in the paper format some participants commented on the length of the questionnaire and the repetition of the questions. Similar research would benefit from considering additional methods to improve the acceptability of a TPB-based questionnaire used to obtain information on the factors that influence intention to undertake MPA and MSA.

6.2.2.1. What this study adds to the literature

As acknowledged in Chapter four section 4.1, past research has administered TPB-based questionnaires to identify and explain the factors that influence intention to undertake PA (e.g. Boudreau & Godin, 2007; Newham et al. 2016; Shirvani et al. 2014). Although the TPB has been used extensively with the PA domain, few studies specifically explored the contribution these variables make to the variance in intention to undertake weekly recommended levels of MPA or MSA (e.g. Aparicio et al. 2015; Dean et al. 2007; Plotnikoff et al. 2008). Furthermore, few TPB-based studies have explored these factors based on menopausal status or use a two component model of the TPB (Vallance et al. 2011). This is despite past research acknowledging the subcomponents of the TPB constructs and their contribution to intention. Nevertheless, past research has provided information on the determinants of intention in diverse populations and provided support for the utility of the TPB.

To my knowledge the research presented in Chapter four of this thesis was the first study to identify and explain the factors influencing pre-, peri- and post-menopausal women's intention to undertake weekly recommended levels of MPA and MSA using a two component model of the TPB. Consequently, the findings from this phase of the research process contributed to our understanding of the factors influencing these women's intention to meet minimum weekly recommended levels of both MPA and MSA.

Thus, completing this research has resulted in information that can be used to inform the design of a theory-based PA intervention to promote women's participation in minimum recommended levels of MPA and MSA at key transitional phases known to impact health. Adopting the two component model of the TPB has also provided a

theoretical contribution that highlights the importance of affective attitudes, self-efficacy and descriptive norms in PA research.

6.2.2.2. Integration of results from phase one and two of the research process

Prior to deciding on the final format of the intervention, the findings and conclusions presented in Chapter three and four of this thesis were considered in combination. From this, it was apparent that the result from phase two of the research process supported the findings from the initial investigation (i.e. phase one). With regards to MPA, it was evident from the research presented in Chapter three, that woman's feelings and emotions contributed to their decision to undertake weekly recommended levels of MPA. This finding was reflected in phase two of the research process with affective attitude identified as a predictor of intention to undertake MPA. These findings suggested that for an intervention to successfully change the target populations MPA behaviour, there was a need to change these women feelings towards undertaking this behaviour.

With regards MSA, it was evident from the results presented in chapter three that pre-, peri- and post-menopausal women held negative attitudes towards undertaking MSA. Given this, and the apparent lack of knowledge on this topic, it emerged in the first phase of research that these women were not undertaking this behaviour. Consequently, levels of MSA were measured in phase two of the research process which illustrated that the majority of pre-, peri- and post-menopausal participants were not undertaking weekly recommended levels of MSA. Affective attitude was also identified as a significant predictor of women's intention to undertake MSA in Chapter four. Consequently, the results from phase one and two suggested that to increase

MSA there was a need to change how these women feel towards undertaking MSA. As acknowledged previously, this may be achieved by increasing women's knowledge of this behaviour given that women were unaware of MSA.

It was apparent in the first phase of the research process that women had concerns about their ability to achieve recommended levels of MPA. Again, this finding was supported in phase two of the research process with self-efficacy identified as a predictor of intention to undertake MPA within the target populations. Similarly, women's knowledge of MSA in phase one illustrated that pre-, peri- and post-menopausal women were unaware of how to perform this behaviour. Thus, it was not surprising that the results presented in Chapter four identified self-efficacy as a significant predictor of intention to undertake MSA. Based on the findings presented in Chapter three and four of this thesis it was clear that there was a need to increase pre-, peri- and post-menopausal women's belief in their ability to achieve recommended levels of MPA and MSA.

The findings discussed in Chapter three also recognised that social norms did not play a key role in the decision to undertake MPA but that encouragement was important. Similarly, in phase two of this work, social pressure from significant others (i.e. injunctive norm) was not identified as a significant predictor of intention to undertake weekly recommended levels of MPA. However, the descriptive component of the model (i.e. seeing others perform 150 minutes of MPA each week) was found to predict intention. As mentioned previously, it was concluded that to promote pre-, peri- and post-menopausal women's intention to undertake MPA, there was a need to provide these women with an opportunity to see others undertaking MPA.

The intervention components were selected to target the factors found to influence pre-, peri- and post-menopausal women's decision to undertake MPA and MSA during phase one and two of the research process. To aid this process, the taxonomy of behaviour change (Michie et al. 2013) which includes 93 BCTs and definitions for each of these was used to select the intervention components (an overview of the selected BCTs are provided in Chapter five, Table 5.1). As mentioned previously, it was also concluded that behaviour-related information should be provided during the intervention that reflected group differences (i.e. in the cognitive process that influenced MPA in phase one and the underlying beliefs linked within intention to undertake MPA in phase two).

Based on the findings presented in Chapter three and four, it was concluded that pre- and post-menopausal women would receive the intervention in person. This format was decided upon to: provide personal motivation and to encourage accountability and commitment. In contrast, an online version of the intervention was designed for peri-menopausal women (Appendix 1) with a view to encouraging participation.

The intervention (described in full in Chapter five) was implemented and the feasibility and acceptability assessed in the final phase of the research process. The main findings from this phase in the research process are discussed below in section 6.2.3.

6.2.3. Chapter five: phase three

The research presented in Chapter five of this thesis was the final phase in the research process. The aim of the research presented in Chapter five was to implement the intervention with a view to determining the feasibility and acceptability of the

intervention and intervention components. To reiterate, this research phase was undertaken in two stages. The first stage comprised of 17 participants (i.e. intervention, n=10; control, n=7: a description of the intervention was provide in Chapter five, section 5.2.1.2). An overview of the research procedure for the control group was presented in Chapter five, section 5.2.1.6. In stage two, all intervention participants partook in an interview to explore their view and opinions towards the intervention and intervention components. The findings from this phase in the research process provided information on the feasibility (e.g. enrolment; withdrawal; attendance); the impact of the intervention on the TPB components targeted within the design; the impact of the intervention on MPA and MSA levels and provided an insight on the acceptability of the intervention and intervention components.

The sample size in this phase of the research process was small which may have impacted the results. However, in general, the intervention proved promising. As mentioned previously, affective attitude and self-efficacy contributed to pre-, peri- and post-menopausal women's intention to undertake recommended levels of MPA and MSA. Descriptive norms were also found to contribute to these women's intention to undertake MPA. Consequently, the intervention components were selected with a view to increasing these constructs. In relation to MPA, the findings indicated a significant time by group interaction on mean scores for affective attitude and self-efficacy with mean values for the intervention group increasing and the control group decreasing Descriptive norms and intention did not reach a level of significance following the intervention however mean score were increasing. With regards to MSA, a significant time by group interaction for affective attitude, instrumental attitude, descriptive norm and intention was observed with mean scores increasing in the intervention group and decreasing in the control group. The intervention components for MSA were not

selected to increase instrumental attitudes or descriptive norms. However, given that the research presented in Chapter three of this thesis highlighted a lack of knowledge in relation to MSA, it is possible that undertaking these activities changed their views on the physical benefits which in turn, influenced their instrumental attitudes. Although it should be noted that mean scores for instrumental attitude were significantly different at baseline.

The findings indicated that mean scores on the TPB component targeted in the intervention were showing an increasing trend. However, the PA results are more conflicting with no significant differences observed between the control and intervention groups, post-intervention. As acknowledged, the procedure used to determine levels of PA, the length of the intervention and the sample size may have influenced these findings. Given that it is recommended MPA is undertaken in bouts of 10 minutes or more to produce health benefits, future research should look at bouts of 10 minutes rather than average METs per day. A main effect for time was observed on levels of MSA. Mean scores showed that both groups increased between baseline and follow up but it appears that the intervention group made more gains (i.e. 0 to 17 minutes per week between baseline and follow up) than the control group (i.e. 2.5 to 6.5 minutes per week between baseline and follow up).

Overall, the qualitative findings suggested that participant's had positive attitudes toward the intervention and the intervention components. The length of the intervention was also viewed positively however, to increase MPA and MSA to recommended levels over time, future research should increase the number of duration of the intervention. Furthermore, it was apparent that while the majority of intervention components were deemed acceptable some were viewed less favourably.

These included: rewards; practical support and monitoring of emotional consequences. Moving forward the findings suggested that these components should be removed, particularly practical social support and monitoring of emotional consequence. In addition, a different form of rewards should be considered. An overview of the proposed changes to recruitment and the intervention design are provided in section 6.4.1.

Although the results provided support for the feasibility and acceptably of the intervention, reflecting on the implementation process has the potential to provide additional information that could be drawn upon to refine the intervention. In recognition of this, a brief reflection on this process is provided before discussing what this study adds to the literature.

Perhaps not surprisingly, one of the main challenges I was presented with was the recruitment of pre-, peri- and post-menopausal participants. On reflection, I should have considered providing more information on the menopause and/or provided a definition of pre-, peri- and post-menopause. Alternatively, I could have considered removing these terms from the research title. However, given that pre- and post-menopausal women were receiving an intervention in person and peri-menopausal women were allocated to an online version, participants' menopausal status needed to be determined. It would appear that peri-menopausal women are a very specific group thus, to increase their participation, future research should recruit these women through clinical practice.

Implementing the intervention was rewarding but a time consuming process. Despite this, greater gains in MPA and MSA behaviour are required; therefore the length of the intervention needs to be increased. Delivering PA interventions face to face has been

reported as the most effective approach (Conn, Hafdahl & Mehr, 2011). However, there is a need to consider the commitment that would be required by participants to attend consultation sessions for a longer duration. Adopting a blended approach (i.e. online/app based activities and consultation sessions) may address this issue and improve the feasibility and acceptability of a longer intervention. Moreover, there is evidence to suggest that internet-based interventions produce a positive effect on PA (Davies, Spence, Vandelanotte, Caperchione & Mummery, 2012). Thus a blended approach could prove advantageous and contribute to the success of the intervention.

One of the main challenges I experienced was encouraging participants to complete their behaviour change diary before returning to the next session. Removing the written aspect of the behaviour change diary from the intervention and logging this information on an online website or app could address this issue and improve motivation. It was apparent that participants were keen to see the process they were making. Thus, this approach would also provide more accessible and visual feedback on their progress.

6.2.3.1. What this study adds to the literature

Interventions using the TPB are undertaken to a lesser extent than exploratory research predicting the factors that influence intention to undertake specific behaviours. Despite this, past interventions have drawn upon the TPB. This research has provided information on the effectiveness of TPB-based interventions and the selected intervention components for a range of health behaviours, including PA (e.g. Conner et al. 2011; Giles et al. 2014; Hardeman et al. 2002). However, one of the main criticisms of past research is the way the TPB is used within some interventions. The

author's guidance suggests that the TPB should be used to inform the intervention design, this involves two phases of exploratory research. Although some researchers follow this guidance (for example: Darker et al. 2010) others use the TPB to explore the difference an intervention makes on the TPB variables.

Although the TPB has previously been used to inform intervention designs, the research included in this thesis is the first intervention to use the two component model of the TPB to inform the design of an intervention to promote pre-, peri- and post-menopausal women's participation in minimum recommended levels of MPA and MSA. Consequently, the research presented in Chapter five is the first study to evaluate the feasibility and acceptability of a TPB-based intervention to promote pre, peri- and post-menopausal women's participation in weekly recommended levels of MPA and MSA.

6.3. Limitations

As with all studies, there are a number of limitations that should be considered when interpreting the results of this work. The main limitation of this work was the sample size of pre-, peri- and post-menopausal women obtained, particularly in phase one and three of the research process. However, the first phase of research employed qualitative methodology and although small sample sizes are commonly viewed as a disadvantage, in qualitative research small samples are frequently used to obtain an in-depth understanding of the topic under investigation. The second phase in the research process achieved a sample of 186 women, when this figure is stratified by menopausal status the number of pre-, peri- and post-menopausal women was relatively small. However, a power calculation was computed and the sample size was deemed

acceptable for the analyses conducted on this data. The third phase in the research process was an initial evaluation of a TPB-based intervention. The sample size was also small in this study and variability between groups was evident due to the randomisation of participants. Thus, it should be acknowledged that a fully powered trial may produce differing results on the outcome variables. However, this phase of the research process was to determine the feasibility and acceptability of the intervention, not its effectiveness. Furthermore, it should also be noted that the majority of participants in phase two and three of the research process had a third level qualification or higher however, there was some variability across studies and between groups. Thus, overall, the results from this work may not be generalisable.

The self-reported measure of PA used in phase one and two of the research process presents a further limitation. It is well accepted that respondents can over/under estimate on self-reported measures of PA. However, a valid and reliable standardised PA measure was used to minimise this issue [IPAQ-SF] (IPAQ-SF, 2003). In phase two and three of this work participants were asked to report their MSA. While measures of muscle strength are available there did not appear to be a standardised measure of MSA. Consequently, a series of questions were devised to collect this information. However, as this work was focused on recommended levels of MSA (i.e. number of days and areas work) these questions did not refer to the intensity of these activities which would have enhanced our understanding of participants' engagement with MSA.

In phase three of this work, the researcher responsible for implementing the intervention also conducted the evaluation. As a result, respondents may have provided socially acceptable answers rather than expressing their true views and

opinions on the intervention. It is argued that evaluations should be undertaken by an independent researcher. However, this was not possible in the context of this PhD.

To conclude, the self-report method used throughout the research process to determine menopausal status was also a limitation of this work. It is recognised that self-reported menopausal status is not always accurate and can be influenced by women's understanding and knowledge of their menstrual cycle. However, accurately determining menopausal status without obtaining a blood sample is difficult. Given the context of this research it would not have been feasible to collect blood samples from all participants. Thus, in line with previous research this work used age and characteristics of menses to determine menopausal status (Brandon et al. 2013; Simpson & Thompson, 2009).

6.4. Final conclusion and recommendations for future interventions and research

There is a clear need for a life course approach to the promotion of minimum recommended levels of MPA and MSA in women at a local, national and global level. It is particularly important that interventions promote and increase women's participation in these behaviours across menopausal phases with a view to reducing the risk of NCD and promoting active ageing, Previous interventions have yielded limited success which would suggest that the factors that influence these women's decision and indeed the intervention components that increase and maintain PA changes are not well understood. Research plays a central role in tailoring an intervention to meet the needs of target populations. However, without implementing and evaluating an intervention, we would not understand what intervention components work well, what doesn't work well, what is acceptable to the target

population and whether the intervention is feasible. The research presented in this thesis informed the design of a TPB-based intervention to promote pre-, peri- and post-menopausal women's participation in minimum recommended levels of MPA and MSA. This intervention was implemented with a view to determining its feasibility and acceptability. In conclusion, the intervention delivered to pre- and post-menopausal women provided feasibility and was deemed acceptable. However, the findings indicated that the acceptability of the intervention could be enhanced and there is a need to develop strategies to promote peri-menopausal women's participation. Consequently, the intervention should be refined as outlined below in section 6.4.1 before proceeding to a large scale evaluation to determine its effectiveness.

6.4.1. Intervention recommendations

Prior to undertaking a fully powered trial of the intervention and determining its effectiveness, the following amendments are recommended:

1. The recruitment strategy should be amended to increase recruitment, particularly in peri-menopausal women.
2. Consider implementing the intervention within a primary care facility or recruiting through primary care (i.e. GP surgeries/HT clinics) to increase recruitment.
3. The reward, monitoring of emotional consequences and practical social support elements of the intervention should be removed. However, an alternative rewards system should be considered.

4. In relation to MPA, additional techniques from the taxonomy of behaviour change should be selected and included in the intervention design to increase descriptive norms.
5. Additional techniques from the taxonomy of behaviour change should be selected and included to support implementation of intentions, with a view to increasing participation in MPA and MSA.
6. Additional classes on MSA should be included.
7. The intervention should include a more comprehensive leaflet how to perform MSA and more difficult variation of these activities.
8. A buddying system or small walking groups should be considered however, it may be necessary to assess and determine this need on entry to the intervention and at pre planned time points to ensure that the needs of all pre-, peri- and post-menopausal participants are being met.
9. The intervention length should be increased with a view to achieving increases in the outcome variables (i.e. increases in MPA and MSA to recommended levels or above).
10. The intervention should adopt a blended approach (i.e. consultation session and online or app based activities).

6.4.2. Research recommendations

Based on the findings presented in Chapter three, four and five of this thesis and the brief reflection on each phase of the research process, it is recommended that the following research is undertaken in the future:

1. The proportion of women meeting recommended level of MSA across the life course should be assessed and data published detailing this information.
2. A health campaign on MSA, the associated benefits and how to undertake these in addition to the aerobic-based should be developed, implemented and evaluated with a view to increasing knowledge and establishing views towards undertaking this behaviour.
3. Women' awareness of the menopause should be explored further and potentially an intervention developed to increase women's knowledge of the menopause, onset, symptoms and the changes that can occur prior to, during and following the menopause.
4. TPB-based studies should continue to explore the utility of the two component model of the TPB within health research, with a view to obtaining further information on the specific components that influence intention and behaviour in diverse populations and between health behaviours.
5. A larger scaled evaluation of the TPB-based intervention designed as part of this thesis should be undertaken once the intervention has been refined. The intervention should aim to include pre-, peri- and post-menopausal women with more diverse educational backgrounds.
6. Future studies may wish to implement and evaluate this intervention more widely (i.e. nationally) to determine its generalisability.

6.4.3. Policy recommendations

The menopausal transition should be recognised as a key transitional phase which provides an opportunity to intervene and improve women's physical and psychological health as they age. Given the benefits of achieving the recommended levels of MPA and MSA for these women, PA interventions should be offered to women specifically during the menopausal transition as part of clinical practice.

6.5. References

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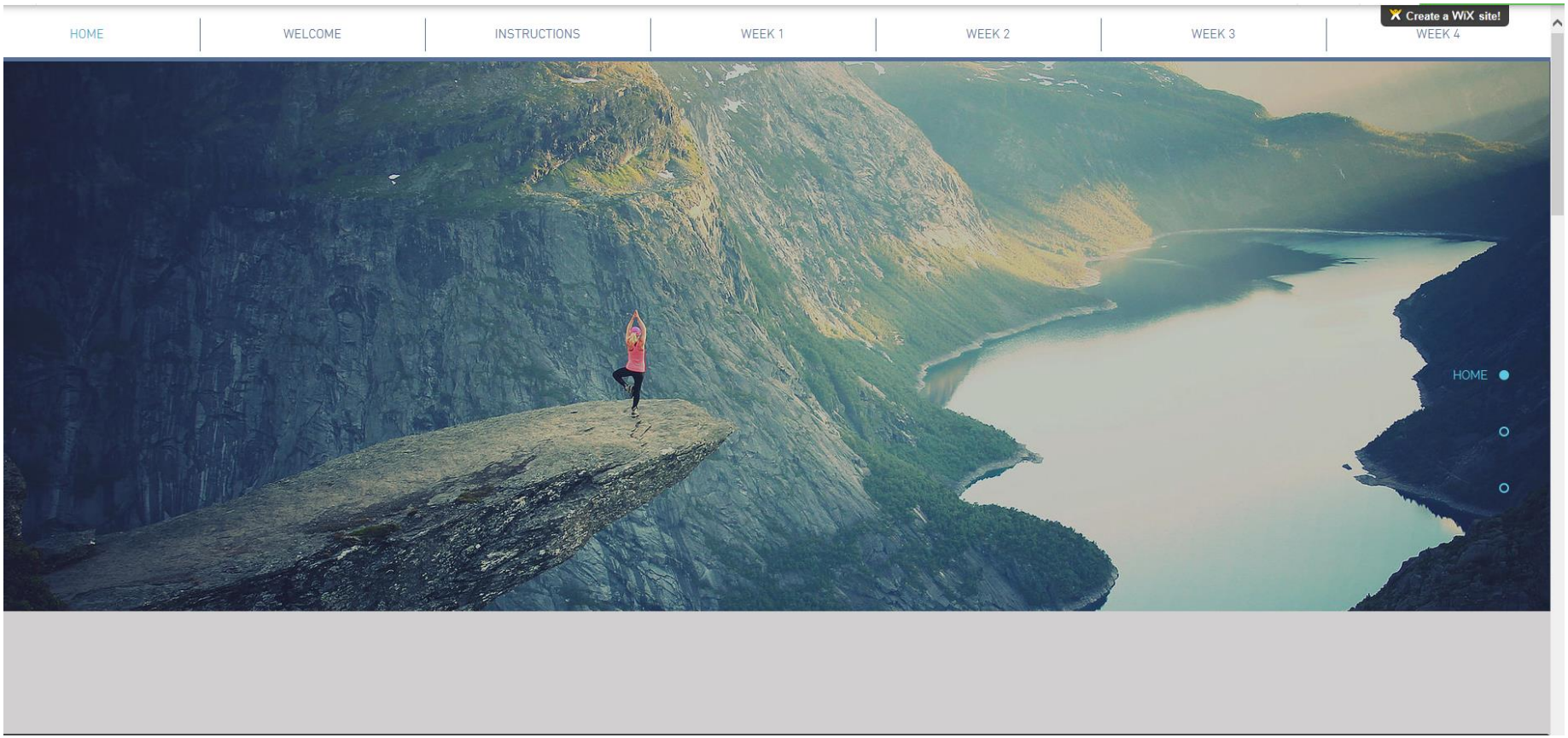
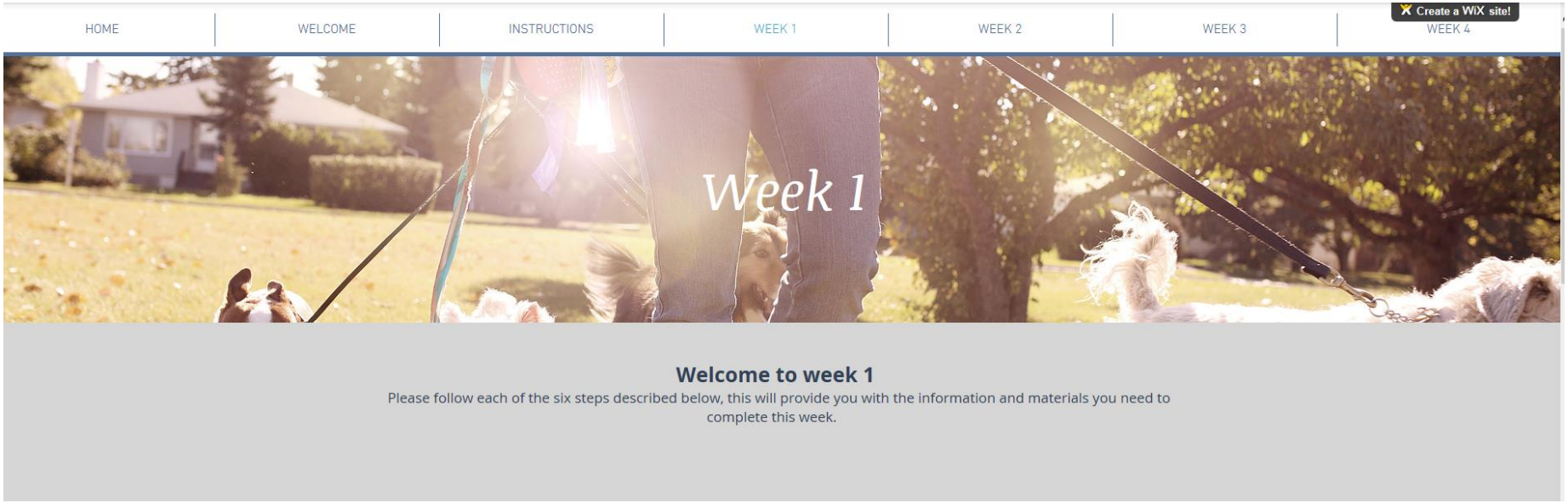
Appendices

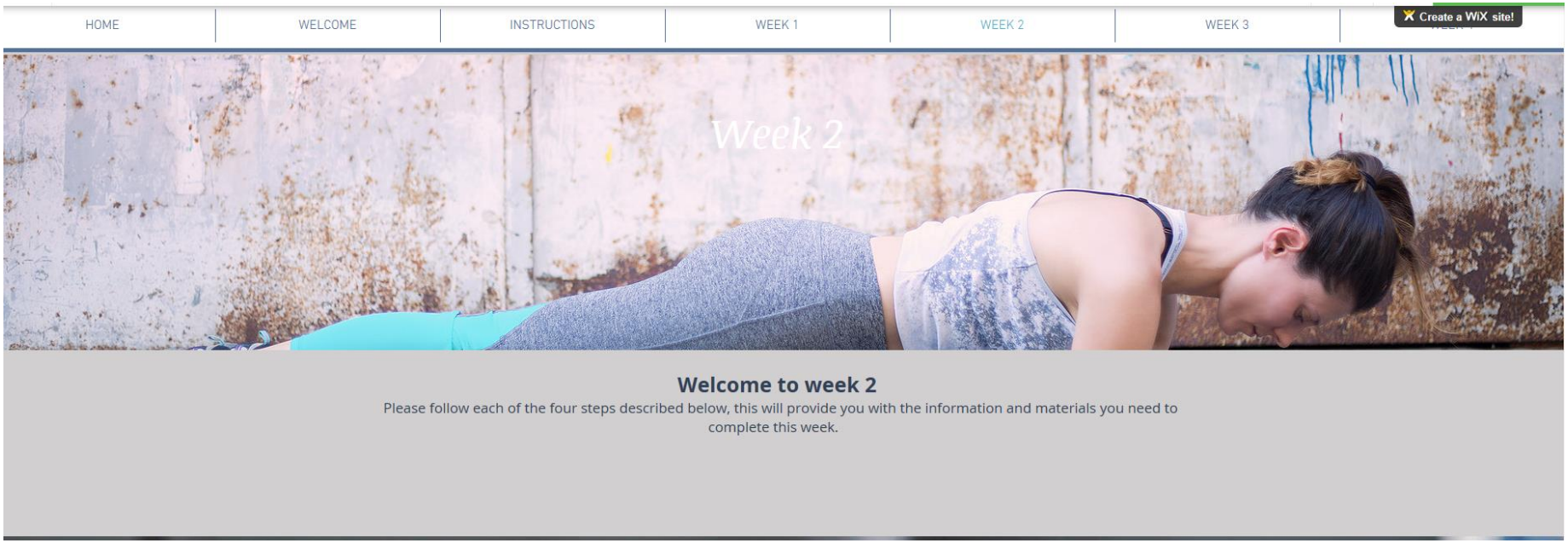
Appendix one – Study 3 sample of the website



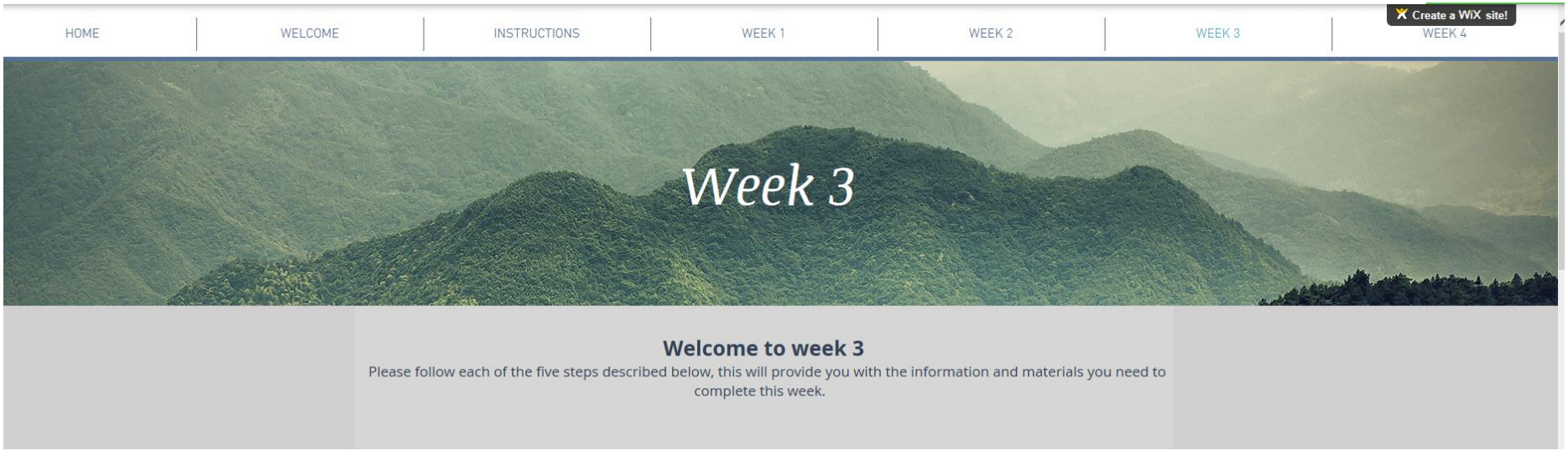
Appendix one – Study 3 sample of the website



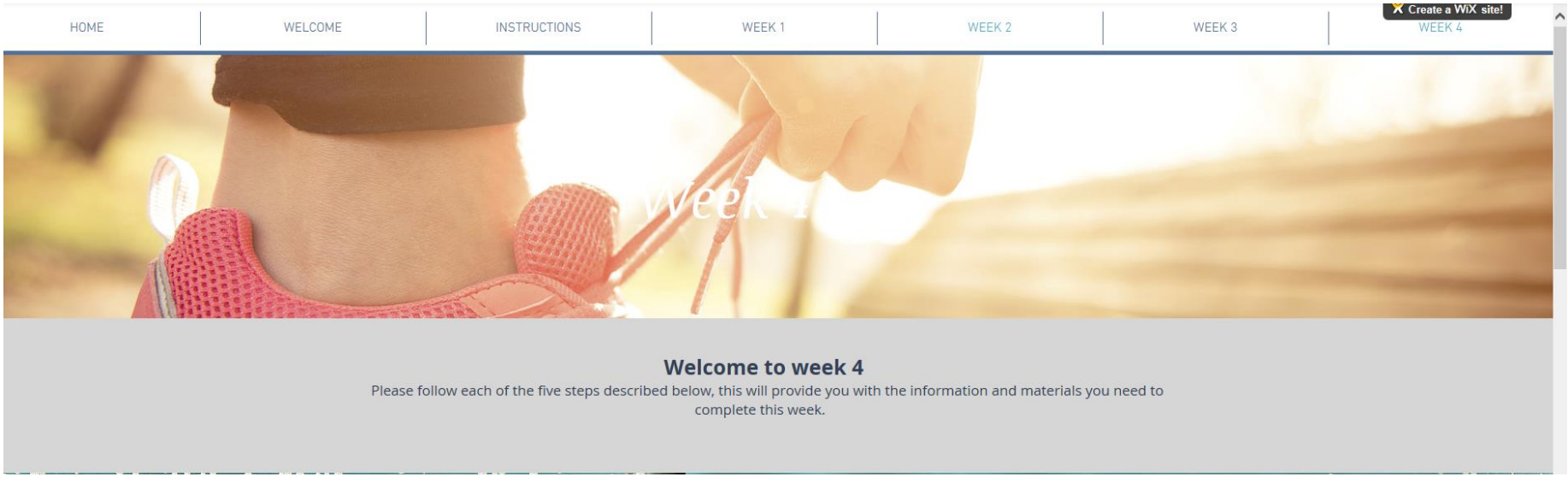
Appendix one – Study 3 sample of the website



Appendix one – Study 3 sample of the website



Appendix one – Study 3 sample of the website



Appendix two – sample of the TPB-based questionnaire

Ulster University

Section 1: Attitudes towards completing 150 minutes of moderate intensity physical activity each week and strengthening exercises on at least two days each week.

In this section we ask a series of questions that make use of rating scales, each with seven places: we would like you to circle the number that best describes your opinion. For example if you were asked to rate the weather on such a scale, the seven places should be interpreted as follows:

Bad:1 2 3 4 5 6 7 : Good
extremely quite slightly neither slightly quite extremely

If you think the weather is quite good, you would circle the number 6. If you think the weather is slightly bad, you would circle the number 3.

First we would like to ask you a number of questions relating to your views on completing 150 minutes (2 ½ hours) of moderate physical activity each week.

Please try to answer all the questions and circle only one number on each scale.

1. I think that doing 150 minutes of moderate physical activity each week would be:	Harmful: 1 2 3 4 5 6 7 :Beneficial extremely quite slightly neither slightly quite extremely
2. Whether or not I do 150 minutes of moderate physical activity each week is up to me.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
3. I intend to do 150 minutes of moderate physical activity each week.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
4. I am confident that I could do 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
5. I think that most people who are important to me would support me doing 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly

Appendix two – sample of the TPB-based questionnaire

6. I think that doing 150 minutes of moderate physical activity each week would be:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
7. I will try to do 150 minutes of moderate physical activity each week.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
8. Most of my work colleagues will do 150 minutes of moderate physical activity each week.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
9. I think that most people who are important to me would encourage me to do 150 minutes of moderate physical activity each week.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
10. I am capable of doing 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
11. I think that doing 150 minutes of moderate physical activity each week would be:	Useless : 1 2 3 4 5 6 7 :Useful extremely quite slightly neither slightly quite extremely
12. I have decided to do 150 minutes of moderate physical activity each week.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
13. I think that most people who are important to me would approve of me doing 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
14. I think that doing 150 minutes of moderate physical activity each week would be:	Unpleasant: 1 2 3 4 5 6 7 :Pleasant extremely quite slightly neither slightly quite extremely

Appendix two – sample of the TPB-based questionnaire

15. I believe I could do 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
16. Most of my friends will do 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
17. I have control over whether or not I do 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
18. I think that doing 150 minutes of moderate physical activity each week would be.	Boring: 1 2 3 4 5 6 7 :Not at all boring extremely quite slightly neither slightly quite extremely
19. I think that doing 150 minutes of moderate physical activity each week would be.	Unenjoyable: 1 2 3 4 5 6 7 :Enjoyable extremely quite slightly neither slightly quite extremely
20. The decision to do 150 minutes of moderate physical activity each week is beyond my control	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
21. Most of my family will do 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly

Appendix two – sample of the TPB-based questionnaire

Next, we would like to ask you a few questions relating to your views on doing activities to improve muscle strength on at least two days each week. Activities should include all major muscle groups to meet recommended levels. Strengthening activities involve using your own body weight or working against a resistance. Examples include exercising with weights, sit ups, push ups or working with resistance bands.

Please try to answer all the questions and circle only one number on each scale.

22. I think that doing activities to improve muscle strength on at least two days each week would be:	Boring: 1 2 3 4 5 6 7: Not at all boring extremely quite slightly neither slightly quite extremely
23. I think that most people who are important to me would encourage me to do activities to improve muscle strength on at least two days each week.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
24. The decision to do strengthening activities on at least two days each week is beyond my control.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
25. I think that doing activities to improve muscle strength on at least two days each week would be:	Harmful: 1 2 3 4 5 6 7 :Beneficial extremely quite slightly neither slightly quite extremely
26. I have decided to do activities to improve muscle strength on at least two days each week.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
27. I am capable of doing activities to improve muscle strength on at least two days each week.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
28. Most of my friends will do activities to improve muscle strength on at least 2 days each week.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
29. I intend to do activities to improve muscle strength on at least two days each week.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly

Appendix two – sample of the TPB-based questionnaire

30. Whether or not I do activities to improve muscle strength on at least two days each week is up to me.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
31. I think that doing activities to improve muscle strength on at least two days each week would be:	Useless : 1 2 3 4 5 6 7 :Useful extremely quite slightly neither slightly quite extremely
32. I am confident that I could do activities to improve muscle strength on at least two days each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
33. I think that most people who are important to me would approve of me doing 150 minutes of moderate physical activity each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
34. I think that doing activities to improve muscle strength on at least two days each week would be:	Unenjoyable: 1 2 3 4 5 6 7 :Enjoyable extremely quite slightly neither slightly quite extremely
35. I will try to do activities to improve muscle strength on at least two days each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
36. Most of my work colleagues will do activities to improve muscle strength on at least 2 days each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
37. I believe I could do activities to improve muscle strength on at least two days each week. .	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
38. I think that doing activities to improve muscle strength on at least two days each week would be:	Unpleasant: 1 2 3 4 5 6 7 :Pleasant extremely quite slightly neither slightly quite extremely
39. I have control over whether or not I do activities to improve muscle strength on at least two days each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly

Appendix two – sample of the TPB-based questionnaire

40. Most of my family will do activities to improve muscle strength on at least 2 days each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
41. I think that doing activities to improve muscle strength on at least two days each week would be	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
42. I think that most people who are important to me would support me to do strengthening activities on at least two days each week.	Disagree : 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly

Now, we would like you to indicate how likely you think it is that each of the following consequences would occur if you were to do 150 minutes of moderate physical activity each week.

43. If I do 150 minutes of moderate physical activity each week I will feel fitter and stronger.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
44. If I do 150 minutes of moderate physical activity each week I will improve my health.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
45. If I do 150 minutes of moderate physical activity each week I will have an opportunity to clear my head.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
46. If I do 150 minutes of moderate physical activity each week I will feel better.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
47. If I do 150 minutes of moderate physical activity each week my mood will improve.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
48. If I do 150 minutes of moderate physical activity each week I will feel less stressed.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely

Appendix two – sample of the TPB-based questionnaire

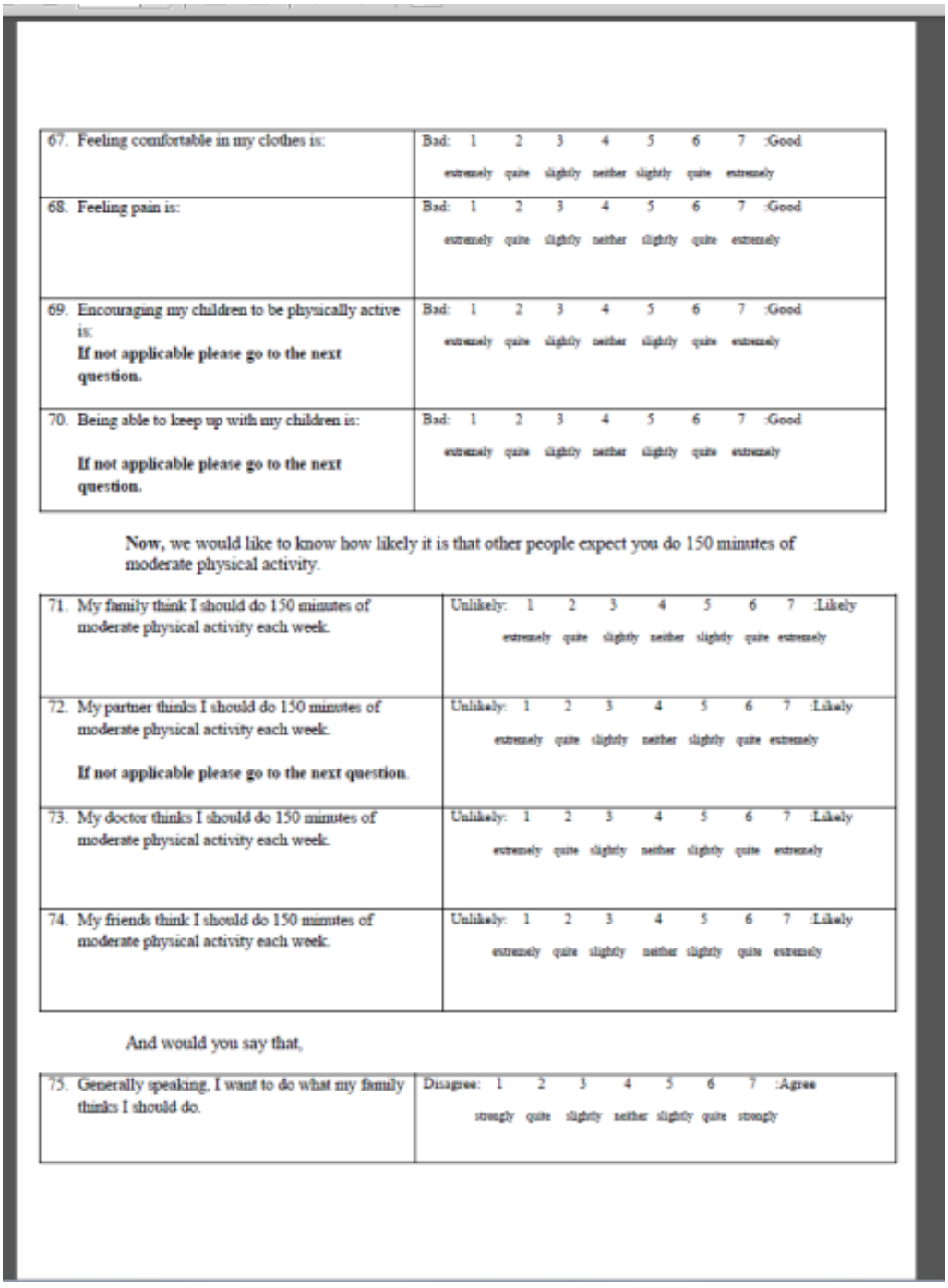
49. If I do 150 minutes of moderate physical activity each week I will lose weight.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
50. If I do 150 minutes of moderate physical activity each week I will feel a sense of achievement.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
51. If I do 150 minutes of moderate physical activity each week I will feel tired.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
52. If I do 150 minutes of moderate physical activity each week I will enjoy doing it.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
53. If I do 150 minutes of moderate physical activity each week my clothes will fit more comfortably.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
54. If I do 150 minutes of moderate physical activity each week it will cause me pain.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
55. If I do 150 minutes of moderate physical activity each week it will encourage my children to be physical active. **If not applicable please go to the next question.**	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite
56. If I do 150 minutes of moderate physical each week I will be able to keep up with my children. **If not applicable please go to the next question**	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely

Appendix two – sample of the TPB-based questionnaire

Next, we would like you to evaluate whether the following consequences would be bad or good. For example if you think that staying healthy is an extremely good thing, you would circle number 7. However, if you feel that staying healthy is extremely bad you would circle number 1 and so on.

57. Feeling fitter and stronger is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
58. Improving your health is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
59. Having time to clear your head is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
60. Feeling better is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
61. Improving your mood is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
62. Feeling less stressed is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
63. Losing weight is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
64. A sense of achievement is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
65. Feeling tired is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
66. Enjoying moderate physical activity is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely

Appendix two – sample of the TPB-based questionnaire



67. Feeling comfortable in my clothes is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
68. Feeling pain is:	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
69. Encouraging my children to be physically active is: **If not applicable please go to the next question.**	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely
70. Being able to keep up with my children is: **If not applicable please go to the next question.**	Bad: 1 2 3 4 5 6 7 :Good extremely quite slightly neither slightly quite extremely

Now, we would like to know how likely it is that other people expect you do 150 minutes of moderate physical activity.

71. My family think I should do 150 minutes of moderate physical activity each week.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
72. My partner thinks I should do 150 minutes of moderate physical activity each week. **If not applicable please go to the next question.**	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
73. My doctor thinks I should do 150 minutes of moderate physical activity each week.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely
74. My friends think I should do 150 minutes of moderate physical activity each week.	Unlikely: 1 2 3 4 5 6 7 :Likely extremely quite slightly neither slightly quite extremely

And would you say that,

75. Generally speaking, I want to do what my family thinks I should do.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly

Appendix two – sample of the TPB-based questionnaire

76. Generally speaking, I want to do what my partner thinks I should do. **If not applicable please go to the next question.**	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
77. Generally speaking, I want to do what my doctor thinks I should do.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly
78. Generally speaking, I want to do what my friends think I should do.	Disagree: 1 2 3 4 5 6 7 :Agree strongly quite slightly neither slightly quite strongly

Below are a number of factors that might prevent and/or encourage you to do 150 minutes of moderate physical activity each week. For each item please indicate the extent to which you agree with each statement this time on a true/false dimension:

79. Not having the time would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
80. Bad weather would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
81. Looking after my grandchildren would influence whether or not I do 150 minutes of moderate physical activity each week. **If not applicable please go to the next question.**	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
82. Having a reason to do physical activity would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
83. Having a personal goal I want to achieve would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely

Appendix two – sample of the TPB-based questionnaire

84. The cost of physical activity classes would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
85. Having company to do activities would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
86. Having access to facilities would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
87. A lack of confidence would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
88. Work commitments would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
89. Family commitments would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
90. Feeling unsafe would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
91. The time of year would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
92. Lack of knowledge about activities I can do at home would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely
93. Having an opportunity to do physical activities at work would influence whether or not I do 150 minutes of moderate physical activity each week.	False: 1 2 3 4 5 6 7 :True extremely quite slightly neither slightly quite extremely

Appendix two – sample of the TPB-based questionnaire

Next, we would like you to indicate if the following statements make it more likely or less likely that you will complete 150 minutes of moderate physical activity each week. For example if you were asked to rate if the cost of activity classes makes it more or less likely on such as scale, the seven places should be interpreted as follows:

Less Likely: 1 2 3 4 5 6 7 :More Likely

extremely quite slightly neither slightly quite extremely

If you think the cost of activity classes would make it extremely less likely that you would complete 150 minutes of moderate physical activity, you would circle the number 1. If you think that the cost of activity classes would make it quite more likely that you would complete 150 minutes of moderate physical activity, you would circle number 6 and so on.

94. When I don't have enough time it makes completing 150 minutes of moderate physical each week:	Less Likely: 1 2 3 4 5 6 7 :More Likely extremely quite slightly neither slightly quite extremely
95. When the weather is bad it makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 2 3 4 5 6 7 :More Likely extremely quite slightly neither slightly quite extremely
96. Looking after my grandchildren makes completing 150 minutes of moderate physical activity each week: **If not applicable please go to the next question**	Less Likely: 1 2 3 4 5 6 7 :More Likely extremely quite slightly neither slightly quite extremely
97. Having a reason to do physical activity makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 2 3 4 5 6 7 :More Likely extremely quite slightly neither slightly quite extremely
98. Having a goal I want to achieve makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 2 3 4 5 6 7 :More Likely extremely quite slightly neither slightly quite extremely
99. The cost of activity classes makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 2 3 4 5 6 7 :More Likely extremely quite slightly neither slightly quite extremely

Appendix two – sample of the TPB-based questionnaire

100. If I have company to do physical activities with it makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely
101. Having access to facilities makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely
102. A lack of confidence makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely
103. Work commitments makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely
104. Family commitments makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely
105. Feeling concerned about your safety makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely
106. The winter time makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely
107. Lack of knowledge about activities I can do at home makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely
108. Having an opportunities to do physical activity at work makes completing 150 minutes of moderate physical activity each week:	Less Likely: 1 extremely 2 quite 3 slightly 4 neither 5 slightly 6 quite 7 extremely :More Likely

Appendix three- Intervention guide

Introduction

Thank you for taking part in this research. This intervention was designed to help you increase your PA levels. The full study runs over six weeks consecutive weeks and as previously mentioned you are randomly allocated to either the intervention or control group. The number of consultation sessions that you attend is dependent on the group that you are allocated to. You will find out which group you are allocated to during our next meeting.

Implementation procedures

Note. Each consultation session should take approximately 45 minutes 1 hr. During this time the facilitator should follow each of the procedures outlined below, by session and support individuals to make informed decisions about their levels of MPA and MSA. Consider the information discussed during the consultation and make recommendations based on this to ensure that these sessions are tailored to the individual.

Initial meeting (to collect baseline measures: intervention/control group)

- Introduce the RT3 monitor.
- Advise participants on how to wear the monitor (i.e. at hip during all waking hours until the next meeting), how the monitor measures their PA, cover important safety precautions (i.e. remove the monitor before showing etc…as the monitor is not waterproof) and inform them that the monitor should be returned at the next meeting.

- Provide a physical activity diary and explain that they should record any muscle strengthening activities that they complete in the diary until the next meeting. Advise that the day, type of activity and duration should be recorded and that the diary should be returned at the next meeting.
- Explain the TPB-based questionnaire and ask for this to be completed during this meeting.
- Record their height and weight and explain why this is collected (i.e. to set up RT3 monitor)
- Explain how the grip strength dynamometer works and measure their grip strength.
- Agree the day/time that you will meet the following week.

Session 1 (intervention/control group)

- Ask them to return their RT3 monitor and diary.
- Review their current MPA and MSA levels based on the information collected using the RT3 monitor and the diary that was provided to record their MSA.
- Discuss information on the physical activity guidelines (intensity, frequency, type of activities), the benefits of performing MPA and MSA.
- Discuss information relating to the menopause, changes that occur and how whether performing MPA and MSA can have a positive impact on this transition.

- Make them aware of the leaflets containing information on recommended levels of PA years and the menopause included within their behaviour change diary for their reference.
- Discuss the pros and cons of engaging in 150 minutes of moderate physical activity and strengthening activities on at least two days each week.
    - Pre-menopause (feel better; clears head; provides a sense of achievement; accurate information on weight related benefits; discuss the associated cost and how to minimise this; discuss that MSA can be enjoyable and provide examples).
    - Peri-menopause (feel better; clears your head; accurate information on weight related benefits; acknowledge that some people are concerned about their personal safety when undertaking PA outdoors, discuss any concerns and how these can be overcome; area)
    - Post-menopause (feel better; sense of achievement; explain how their confidence performing PA will grow over time; tiredness and how this can help those who experiences problems sleeping).
- Discuss how they could perform recommended levels of MPA and MSA. Talk over the leaflet demonstrating MSA that they can complete at home and how they can achieve recommended levels of MSA.
- Ask them to set personalised MPA and MSA goals (minutes) planning how, when and where the goal related behaviours will occur.
- Recommend they start slowly and then gradually increase their MPA and MSA.
- Introduce the behaviour change diary and how it should be used.
- Ask them to write their goals in their behaviour change diary.

- Ask them to complete their behaviour change diary before returning to the next meeting and to bring this with them.
- Inform them that they will receive an SMS to remind/encourage them to complete their weekly goals.
- Agree a date/time to meet the following week.

Session 2 (intervention group only)

- Review goals and discuss the content of their behaviour change diary.
- Discuss the factors that influenced whether they met their goals.
- Discuss the types of activities they did and whether they enjoyed these.
- Depending on their progress set new weekly MPA and MSA goal or modify the previous week's goals, planning how, when and where the goal related physical activity will occur.
- Encourage them to look ahead for events which may hinder their goal success and together think of ways to reduce the chance that these will influence whether or not they achieve their goals.
- Ask them to complete an if-then worksheet to prompt rehearsal and repetition of the behaviours. Remind them that they this information is in their behaviour change diary and that they can consult it throughout the week.
- Ask them to write their goals in their behaviour change diary.
- Ask them to complete their behaviour change diary before returning to the next meeting and to bring this with them.
- Remind them that they will receive an SMS to remind/encourage them to complete their weekly goals.

- Remind them that there is a second session this week (i.e. a physical activity class with a trained instructor who will demonstrate MSA and ask them to model them). Encourage them to attend and inform them of the date/time.
- Agree a date/time to meet the following week.

PA class (intervention group only)

- Instructor to demonstrate the MSA provided in the MSA leaflet and also demonstrated variations to these and how these activities could be made more difficult as they progress.
- Ask participants to model these activities and encourage them to practice these at home.

Session 3 (intervention group only)

- Review goals and discuss the content of their behaviour change diary.
- Discuss the factors that influenced whether they met their goals.
- Discuss the types of activities they did and whether they enjoyed these.
- Depending on their progress set new weekly MPA and MSA goal or modify the previous week's goals, planning how, when and where the goal related physical activity will occur.
- Encourage them to look ahead for events which may hinder their goal success and together think of ways to reduce the chance that these will influence whether or not they achieve their goals.

- Ask them to complete an if-then worksheet to prompt rehearsal and repetition of the behaviours. Remind them that they this information is in their behaviour change diary and that they can consult it throughout the week.
- Ask them to write their goals in their behaviour change diary.
- Go through the physical activity affect scale. Ask them to complete this scale before and after they complete their weekly goals.
- Discuss potential rewards for achieving their goals (e.g. buy a new top; go out with friends; make time to watch their favourite TV programme in the forthcoming week). Then ask for them to identify a reward, write this in their diary and encourage them to reward themselves in this way once they have completed their goals.
- Ask them to monitor the MPA and MSA and complete their behaviour change diary before the next meeting.
- Remind them that they will receive an SMS to remind/encourage them to complete their weekly goals.
- Agree date/time of next meeting.

Session 4 (intervention group only)

- Review goals and discuss the content of their behaviour change diary including PA affect scales.
- Discuss the factors that influenced whether they met their goals.
- Discuss the types of activities they did and whether they enjoyed these.

- Depending on their progress set new weekly MPA and MSA goal or modify the previous week's goals, planning how, when and where the goal related physical activity will occur.
- Encourage them to look ahead for events which may hinder their goal success and together think of ways to reduce the chance that these will influence whether or not they achieve their goals.
- Participants will be asked to identify a family member/s (partner, children, grandchildren, siblings, parents etc.…), friend or work colleague who is physically active and asked to arrange a time (in line with goals and planning) to complete one or more of the weekly goals together. Discuss how they will do this and what would prevent them from achieving this goal.
- Ask them to monitor the MPA and MSA and complete their behaviour change diary before the next meeting.
- Remind them that they will receive an SMS to remind/encourage them to complete their weekly goals.
- Agree date/time of next meeting.

Session 5 (intervention and control group)

- Review goals and discuss the content of their behaviour change diary (**intervention group only**).
- Introduce the RT3 monitor.
- Advise participants on how to wear the monitor (i.e. at hip during all waking hours until the next meeting), how the monitor measures their PA, cover important safety precautions (i.e. remove the monitor before showing etc…as

the monitor is not waterproof) and inform them that the monitor should be returned at the next meeting.

- Provide a physical activity diary and explain that they should record any muscle strengthening activities they complete in the diary until the next meeting. Advise that the day, type of activity and duration should be recorded and that the diary should be returned at the next meeting.
- Explain the TPB-based questionnaire and ask for this to be completed during this meeting.
- Record their height and weight and explain why this is collected (i.e. to set up RT3 monitor)
- Explain how the grip strength dynamometer works and measure their grip strength.
- Agree the day/time that you will meet the following week to return the monitor/diary.

Session 6 (intervention and control group)

- Ask them to return their RT3 monitor and diary.
- Briefly review their MPA and MSA levels based on the information collected using the RT3 monitor and the diary they used to record their MSA.
- Briefly highlight any noticeable differences (e.g. intensity; duration; types of activities undertaken) between the beginning and the end of the intervention.
- Ask them if they would like to take part in an interview to evaluate the intervention **(intervention group only)**.
- Conduct an interview with those willing to take part **(intervention group only).**